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INSTALLATION ENERGY CONTROL SYSTEM ANALYSIS PROGRAM.(U)
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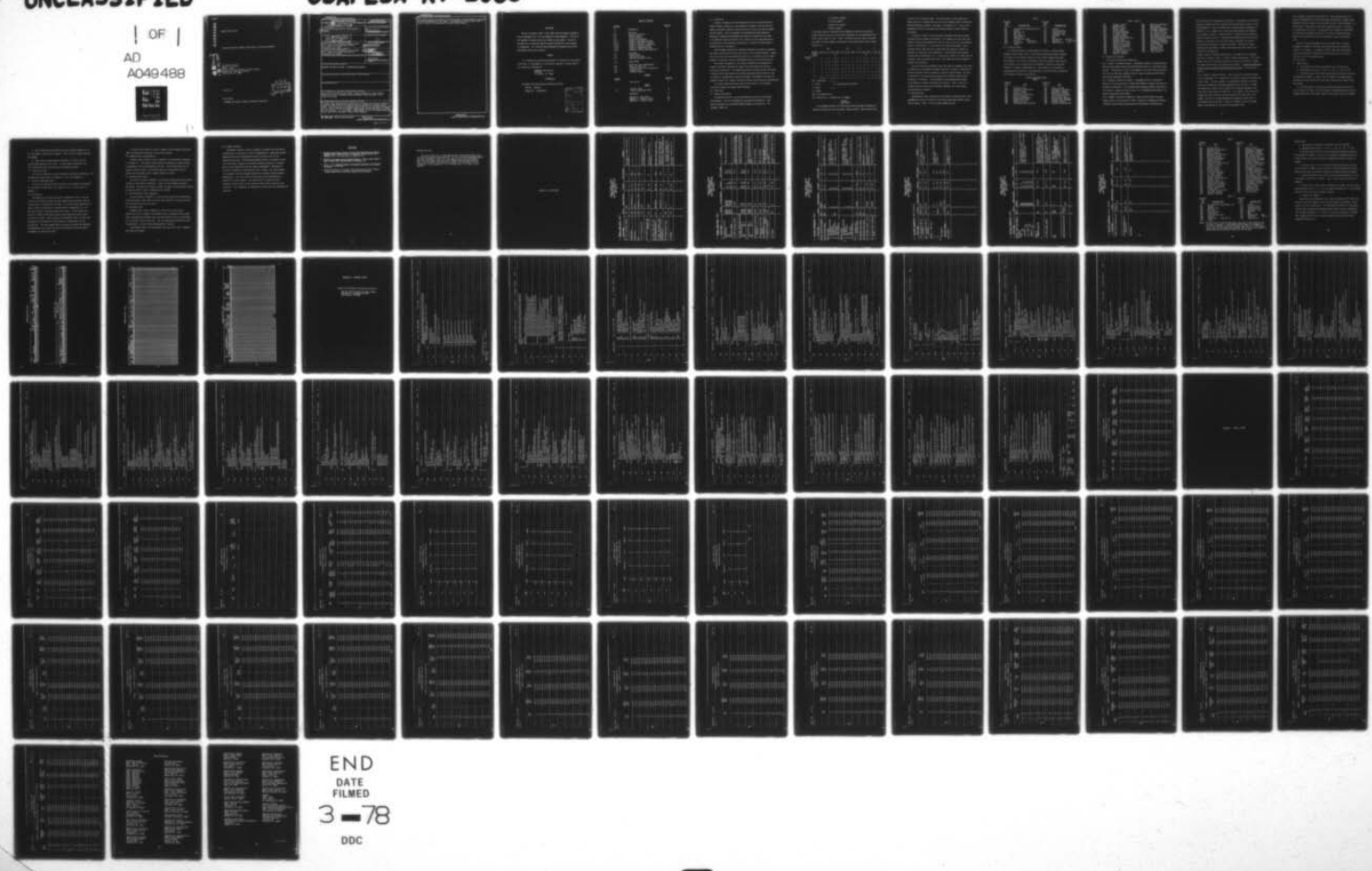

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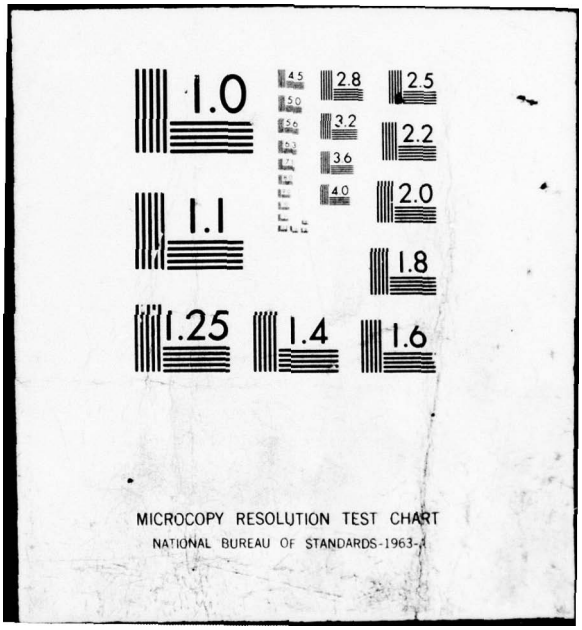
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Report FESA-RT-2033

INSTALLATION ENERGY CONTROL SYSTEM ANALYSIS CALCULATION PROGRAM

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Fort Belvoir, VA 22060

1 June 1977

Final Report

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Installation Energy Control System Analysis Program uses previously developed methods, ~~(Ref 1 & 2)~~ to estimate the cost and savings of an energy control system. The program uses the guidance found in AR-11-28 to calculate the present worth of options analyzed and compares them against the baseline where no system has been employed, i.e., no savings. Simple payback is also calculated using the Energy Conservation Investment Program (ECIP) guidance.

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This report explains the meaning of the input data, how the program is exercised and the interpretation of the output. The appendices contains input forms, a source listing of the program and a sample program output.

DISCLAIMER

The use of industry names in this report and the computer program is not an indorsement of or for the products of these companies. The use is not intended to compare prices nor reflect on any product. The use is intended only to establish relative pay-off periods and a high average is recommended. The value and costs obtained are estimates and are not construed as definitive or actual.

CHANGES

It is requested and would be appreciated if information on any errors, corrections, or improvements in calculations, methods, or values used in this program be forwarded to:

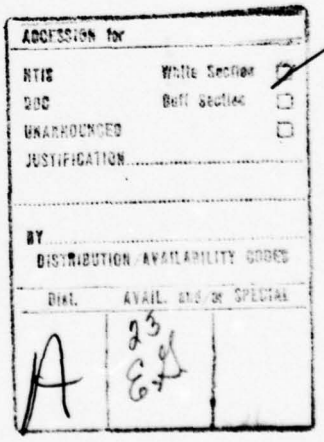
Commander and Director
USA FESA
Ft. Belvoir, VA 22060

INFORMATION

Assistance and advice may be obtained by calling:

Autovon - 354-5510

Commercial - 703-664-5510



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1.0 Introduction

A report, "Automation and Centralization of Facilities Monitoring and Control Systems", Reference 1, was prepared to document a step-by-step procedure to determine potential energy and dollar savings using central energy control systems. Costs of equipment and implementation were presented. Additional information and guidance for analysis of feasibility was given in the DAEN-FEU Technical Note No. 77-8, "Energy Control System Feasibility Considerations" that contained a FESA report, "Guidance for Energy Control Systems Analysis", Reference 2.

These documents contain the information necessary to perform an economic and energy analysis and to obtain cost estimates for funding requests. However, the calculations must be performed by hand or by a calculator and, for large numbers of buildings, require a considerable amount of man effort and time.

The program, documented in this report, automates the procedures described in the above references to reduce time requirements and increase calculation information. The program calculates the energy savings achievable in terms of BTU's delivered to the building envelope and the dollars or cost of the BTU's; implementation costs and equipment requirements; and gives the economic analysis for single or multiple buildings (facilities and installations).

This report explains the use, input and the results of the analysis calculation program for energy control systems.

2.0 Input Data

2.1 General Information

As presently written, up to 120 buildings can be run on the program and analyzed. This can be expanded by increasing the dimensions. Data must be developed on the buildings HVAC equipment to be analyzed. The equipment items are:

Air Handlers (number)

Chillers (number)

Exhaust Fans (number)

Dampers (number)

If the above pieces of equipment do not adequately describe the existing system, they can serve as an equivalent replacement for the undescribed item from a control point of view. Figure 1 displays the array used to calculate the number of points needed to accomplish a given HVAC system control scheme (Section 2.4).

		AHU				CH.				E.F.				D.			
	Control	S/S	R	A	B	S/S	R	A	B	S/S	R	A	B	S/S	R	A	B
(See Sec. 2.4)	Control Scheme																
	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0
	6	0	2	2	0	0	4	6	0	0	0	0	0	0	0	0	0
	8	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0

S/S = Start/Stop

R = Rest

B = Binary

Discrete points (digital)

A = Analog

AHU = Air Handling Unit

Ch = Chiller; E.F. = Exhaust Fan; D = Dampers

Figure 1
Point Array

As an example consider a building which employs equipment shutdown and that the building only has a hot water radiator system. Here one would want

to control the circulation pump. This would require a start/stop and a binary point and is described by any one of the equipment types in the array which corresponds to Scheme 1 (see Page 5, Paragraph 2.4.1). Thus, an air handling unit would be inputted and the proper number of points would be calculated.

The type of system in the building must be known to be able to select the energy savings scheme to be applied. For example, you can't use a temperature reset savings scheme with a fan coil unit or you can't use enthalpy control or optimization if a building has no ventilation system. Thus, a building survey, requiring up to no more than two hours per building, is necessary to obtain the input information. The buildings to be surveyed are described in References 1 & 2. A good rule of thumb is to start with all buildings larger than 8000 square feet. This number may then be lowered if economics are favorable.

During the building equipment survey, the items of equipment, the repair or renovation or replacement equipment required for control or regulation of the HVAC equipment should be noted and listed for each building. The cost of the repair or new construction necessary for feasible control may be estimated or calculated. The seriousness of the estimate may be based on the degree of accuracy required by the analysis. Thus, a first cut analysis would not require the refinement necessary for a final sophisticated design calculation.

2.2 Building Types

Buildings have been categorized into 19 types of functional use. This breakdown was used to correspond to the energy usage data gathered, known and calculated. Table I lists the usage number and type.

TABLE I

BUILDING TYPE NO.	BUILDING TYPE	BUILDING TYPE NO.	BUILDING TYPE
001	Enlisted Men's Recreational Ctr.	011	Library
002	Theater	012	Office Building
003	Bowling Alley	013	Laboratory (oil)
004	NCO Club	014	Laboratory (gas)
005	Post Exchange	015	Barracks
006	Commissary	016	BOQ
007	Enlisted Men's Mess	017	Machine Shop (see Sec.
008	Laundry (see Sec 3.1	018	Warehouse 3.1 Gen note
009	Field House Gen note C)	019	Dental Clinic D)
010	Chapel		

2.3 Climatic Effects

For simplicity and to include effects of humidity, a table has been prepared listing large cities in the US and the associated number assigned. This table is to be used to account for the climatic changes associated with location. For a given installation, pick the closest or most descriptive climatic city to account for the difference in heating, cooling and humidity in relation to Washington, DC. Data inherent in the program is associated with conditions in the Washington, DC area and must be normalized for different locations using Table II.

CLIMATIC ADJUSTMENT TABLE
TABLE II

LOCATION NO.	CITY	LOCATION NO.	CITY
001	Ablilene, Texas	029	Miami, Florida
002	Albuquerque, New Mexico	030	Minneapolis, Minnesota
003	Amarillo, Texas	031	Montgomery, Alabama
004	Atlanta, Georgia	032	Nashville, Tennessee
005	Bakersfield, California	033	New Orleans, Louisiana
006	Billings, Montana	034	New York, New York
007	Boston, Massachusetts	035	North Platte, Nebraska
008	Brownsville, Texas	036	Oklahoma City, Oklahoma
009	Casper, Wyoming	037	Phoenix, Arizona
010	Charleston, South Carolina	038	Raleigh, North Carolina

TABLE II (CON'T)

011	Chicago, Illinois	039	Red Bluff, California
012	Columbus, Ohio	040	Reno, Nevada
013	Denver, Colorado	041	Rochester, New York
014	El Paso, Texas	042	Sacramento, California
015	Fargo, North Dakota	043	St. Louis, Missouri
016	Ft. Smith, Arkansas	044	Salt Lake City, Utah
017	Ft. Worth, Texas	045	San Antonio, Texas
018	Fresno, California	046	San Francisco, California
019	Hatteras, North Carolina	047	Sault Sante Marie, Michiga
020	Houston, Texas	048	Seattle, Washington
021	Jackson, Mississippi	049	Shreveport, Louisiana
022	Jacksonville, Florida	050	Tallahassee, Florida
023	Kansas City, Missouri	051	Tampa, Florida
024	Knoxville, Tennessee	052	Tucson, Arizona
025	Laredo, Texas	053	Washington, DC
026	Los Angeles, California	054	Winslow, Arizona
027	Las Vegas, Nevada	055	Yuma, Arizona
028	Memphis, Tennessee		

2.4 Energy Saving Schemes

The various conservation schemes are:

2.4.1 Scheme 1, Equipment Shutdown. Programmed shutdown of building heating and cooling equipment during unoccupied periods results in significant energy savings. The magnitude of the savings depends on the heat transfer characteristics of the building, equipment capacity, type, and operating efficiency, and outside temperature conditions.

2.4.2 Scheme 2, Outside Air Shutoff. Programmed shutoff of outside air consists of closing outside air intakes and shutdown of exhaust fans when the building is unoccupied. For buildings where equipment operates continuously, the savings in energy cost can be large. It is recommended that Scheme 2 be used in conjunction with Scheme 1.

2.4.3 Scheme 3, Outside Air Reduction. Many building systems have been found to draw in more outside air than is required for adequate ventilation. Therefore, each building system should be investigated to determine how

much the outside air quantity may be reduced. An adjustment of the minimum outside air damper setting to decrease the outside quantity could be a one time adjustment or could be combined with variable setting equipment as in Scheme 2, 4 or 6. Scheme 2 and 3 should be unsed together with Scheme 1.

2.4.4 Scheme 4, Option 1, Enthalpy Control. A popular energy conserving scheme is enthalpy control. By measuring the temperature and the relative humidity an estimate of the total heat content (sensible and latent) of both return and outside air streams can be made. Then the air stream requiring the least amount of energy to maintain the proper comfort level is used for the supply air.

Scheme 4, Option 2, Enthalpy Optimization. An extension of the concepts described in enthalpy control is that of enthalpy optimization. This control scheme mixes the air streatm (outside air or return air) which will impose the lowest cooling load on the mechanical equipment. It should be noted that either savings of Scheme 4 should be used but not both. The savings are similar.

2.4.5 Scheme 6, Temperature Reset. Energy savings are available through reset or adjustment of air temperature in a mixed air system like double duct and multizone. The basic concept is to decrease the amount of mixing by reducing the temperature difference between the hot and cold air streams. The temperature to which the air streams can be adjusted depends on the zone requring the coldest or hottest air. For example, a conference room crowded with people requires the most cooling of any other zone in the system. The cold air stream temperature is adjusted or reset until it just matches the cooling load. The hot air stream is reset in the same manner, and adjusted for the zone with the heating load.

2.4.6 Scheme 8, Forecasting Peak Reduction. Peak reduction under this scheme is accomplished by shutting down selected equipment (shedding) when desirable to reduce a peak during any demand interval. What equipment is to be shut down is determined by the control system according to a priority list established by the user. The desirability of shedding is determined by forecasting the demand at the end of a particular demand period and comparing the predicted value to an established (ideal) target demand limit.

Should the forecasted demand be over the target value, selected equipment is shutdown in the order specified by the user to lower the forecast of the demand. A subsequent forecast under the target demand causes the resumption of equipment to operating status or no action if there are no units on disabled status.

3.0 Data Cards

3.1 General Notes

a. The program as structured can analyze up to 120 buildings.

b. Abbreviated units used: C= 10^2, K = 10^3, M = 10^6, G = 10^9.

c. Buildings types 8 and 9 require estimated cooling energy savings to be provided for Schemes 1, 2 and 4, and for Scheme 3, estimated heating and cooling energy savings must be provided, otherwise zero energy savings are assumed.

d. Building types 17 & 18 require estimated cooling energy savings to be provided for Scheme 4, and for Scheme 3, estimated heating and cooling energy savings must be provided, otherwise zero energy savings are assumed.

e. Some installations may be able to use an existing computer or to tie into another installation's computer. Thus, a zero or nominal cost may be assessed.

f. Right justify integer numeric characters, (I4, 000), and left justify alpha characters (A5, FY77). All real numeric characters (i.e., F6.2, 500.00) must have the decimal point placement inputted.

3.2 Installation Cards

Two cards are required to input the general installation information. The information on these cards is at pages 13, 14 and 19 of Appendix A.

3.3 Building Information Cards

Two cards are required for each building to be included in the analysis. The information on these cards is at pages 15, 16, 17, 18, 20 and 21 of Appendix A.

4.0 Calculations

The methods of calculation are given in References 1 and 2. The consumption and estimated savings have been updated using known data from the installations in the Washington, DC area. If building energy consumption is known, either from metering or an energy audit of consumption (i.e., oil delivery receipts), then those values can be input. If the savings for a particular scheme or additional savings can be quantified, these savings can also be included. Dollar savings for maintenance, labor, or other cost avoidance may be prorated for the buildings and incorporated into the calculations. The simple payback period calculations assume that operating and maintenance costs (recurring costs) are balanced or offset by annual maintenance and operating savings.

A listing of the program is given in Appendix B with comments explaining what is calculated or performed in the various sections.

5.0 Output Data and Interpretation

A sample output listing is given in Appendix C and explained in Sections 5.1 through 5.4. Each output listing gives the information on each building corresponding to the column heading at the top. The building order for the economic analysis output. The building order for the economic output is ranked from the highest overall economic benefit to lowest.

5.1 Energy Saving Listing

The initial listings in Appendix C are the total heating and total cooling savings for each scheme in GBTU/year. Totals for each scheme are given at the bottom. Following the listing by scheme, the yearly building energy savings for each building is given in GBTU/year and in $/year.

5.2 Building Control Point Tabulation

The next section of Appendix C is the building control point tabulations giving the number of each type of control point required for the building and the individual and cumulative totals.

5.3 Equipment Costs

Equipment costs listed in Appendix C include local wiring costs, remote point costs, telephone line equipment costs, estimated building repair costs, estimated new equipment costs, and total building costs, as applicable, for five typical industry suppliers. The five supplies were arbitrarily used from Reference 1 as typical and representative of industry.

The estimated repair and new equipment costs have to be input, otherwise zero costs are assumed.

5.4 Economic Analysis

The economic analysis listing in Appendix C presents the buildings by relative merit of savings minus cost of implementation. Operating and maintenance costs and ECS implementation costs are given as well as the cumulative total cost. The Discounted Payback Period is presented in years. This calculation is based on the economic guidance presented in "Economic Analysis and Program Evaluation for Resource Management", (Reference 3). An asterisk represents a time period of over 10 years. The Simple Payback is the payback time using Energy Conservation Investment Program guidance (Reference 4). All cost savings are escalated to the expected year of operation for simple payback. The cumulative BTU's saved per dollar invested is given as well as the cumulative total energy savings per year in dollars. This information is presented for each of the five representative suppliers.

REFERENCES

1. Automation and Centralization of Facilities Monitoring and Control Systems, Report number ED 76-1, by Reynolds, Smith & Hills, Inc., Jacksonville, FL for USA FESA, Ft. Belvoir, VA.

2. Guidance for Energy Control Systems Analysis, Report number FESA-RT 2023, 2 March 1977, USA FESA-RTD, Ft. Belvoir, VA.

3. AR No. 11-28, Economic Analysis and Program Evaluation for Resource Management, 15 Jan 1976.

4. Assistant Secretary of Defense (I&L) dated 24 March 1977, Subject: "Energy Conservation Investment Program (ECIP) Guidance".

Multiple Run Card.

This card allows from 1 to 99 separate data (installation) decks to be run once the program has been compiled. It is to be placed immediately before the first installation card (91). The number of runs is to be punched in the first two columns, right justified. Immediately following each data deck a multi-punched 7,8,9 card must be placed. The final deck is to be followed by a multi-punched 6, 7, 8, 9 card and the 7, 8, 9 card is to be deleted.

APPENDIX A - DATA CARDS

ENERGY CONTROL SYSTEM
COMPUTER PROGRAM
DATA INPUT INSTRUCTIONS
AND SHEETS

1. GENERAL INPUT DATA, CARD 1

Field Name	Units	Input Example	Columns	Field Length	Remarks
LOC. NO. (Location Number)	N/A	053	1 - 3	I3	Use location number from Table 1, attached.
Installation	N/A	Ft. Belvoir, VA	4 - 27	A24	
Fiscal Year	N/A	FY77	29 - 33	A5	
Date	N/A	February 3, 1977	34 - 51	A18	
Curr Yr (Current Year)	N/A	1977	52 - 55	I4	Year Program is run to calculate discounted payback.
EXP YR OPER (Expected Year of Operation)	N/A	1978	56 - 59	I4	Year ECS is expected to be operational.
ECS YEARLY OPER COST (ECS Yearly Operating Cost)	$	45,000.00	60 - 68	F9.2	Operating Personnel Salaries.
EST CENT. CON INSTALL COST (Estimated Central Console Installation)	$	000,000.00 or 0.00	69 - 77	F9.2	Includes any additional cost to install ECS, e.g., building renovation to central console, etc.
COM (Communication Type)	N/A	1 or 2	78	I1	1. Indicates telephone lines. 2. Indicates coax cables.
Card Number	N/A	91	79 - 80	I2	91 must be inputted once for this card.

ENERGY CONTROL SYSTEM
COMPUTER PROGRAM
DATA INPUT INSTRUCTIONS
AND SHEETS

1. GENERAL INPUT DATA, CARD 2

Field Name	Units	Input Example	Columns	Field Length	Remarks
EC (Energy Cost List)	$				
Electricity	$/Kwh	00.0232	1 - 7	F7.4	Fuel Cost Paid by Installation
Gas	$/CCF	00.112	8 - 14	F7.4	
Oil	$/GAL	00.4007	15 - 21	F7.4	
Electric Demand	$/Kw	2.000	22 - 28	F7.4	
INT RATE (Interest Rate)	%	10.00	29 - 33	F5.2	Interest rate used to calculate annual interest on ECS investment.
YEF YEARLY ESCALATION FACTORS					Long term differential escalation factors; discount payback period.
Electricity ELE 1	%/100	.07	34 - 37	F4.3	
Gas GAS 1	%/100	.08	38 - 41	F4.3	
Oil OIL 1	%/100	.08	42 - 45	F4.3	
Electricity ELE 2	%/100	.16	46 - 49	F4.3	Short term escalation factors; simple payback period at EXP YR OPER.
Gas GAS 2	%/100	.15			
Oil OIL 2	%/100	.16			
EFM (Maintenance Escalation Factor)	%/100	.06	58 - 61	F4.2	Must be inputted.
EFO (Operation Escalation Factor)	%/100	.06	62 - 65	F4.2	Must be inputted.
EEF (Equipment Escalation Factor	%/100	.08	66 - 69	F4.2	Must be inputted.
CC (Computer Console)	N/A	1	70	I1	1 = New Computer Console Installed 0 = Existing Computer Console Used See Note 5.
Card Number	N/A	92	79 - 80	I2	92 must be inputted once for this card.

ENERGY CONTROL SYSTEM
COMPUTER PROGRAM
DATA INPUT INSTRUCTIONS
AND SHEETS

2. BUILDING INFORMATION, CARD 3

Field Name	Units	Input Example	Columns	Field Length	Remarks
BLD NO. (Building Number)	N/A	00200	1 - 5	I5	
BLDG (Building Type)	N/A	007	6 - 8	I3	Use Table II. See Notes 3 & 4.
COOLING SCHEME					
1. Equipment Shutdown		1	9	I1	"1" indicates scheme used.
2. OA Shutoff		1	10	I1	"0" indicates scheme not used.
3. OA Reduction		0	11	I1	See Notes 3 and 4.
4. Enthalpy Control	N/A	1	12	I1	
6. Temp Reset		0	13	I1	(If Scheme 6 used see Page 16).
8. Peak Reduction		0	14	I1	
HEATING SCHEME					
1. Equipment Shutdown		1	15	I1	"1" indicates scheme used.
2. OA Shutoff		1	16	I1	"0" indicates scheme not used.
3. OA Reduction		0	17	I1	Scheme 4 always zero. See Notes
4. N/A		0	18	I1	3 and 4.
6. Temp Reset		0	19	I1	
8. Peak Reduction		0	20	I1	(If Scheme 6 used see Page 16).
SQ. FT. (Square feet, building areas)	ft^2	127,000.	21 - 28	F8.0	
IHF (Heating Fuel Type)	N/A	3	31	I1	1 = Electricity; 2 = Gas; 3 = Oil
ICF (Cooling Fuel Type)	N/A	1	32	I1	Same as IHF.
IRC (Equipment Repair Cost)	$	150,000	33 - 39	I7	Cost which enables equipment to be controlled.
NEC (Estimated New Equipment Cost)	$	100,000	40 - 46	I7	Installed Equipment.

2. BUILDING INFORMATION, CARD 3 (Cont'd)

Field Name	Units	Input Example	Columns	Field Length	Remarks
EESH (Estimated Heating Saving)	GBTU/yr	0.0	47 - 51	F5.3	Savings that can be accounted for in addition to that calculated by schemes.
EESC (Estimated Cooling Saving)	GBTU/yr	0.07	52 - 56	F5.3	
SCHEME 6 Temp Reset					
ΔT	F	6.0	57 - 60	F4.1	All data must be provided when scheme 6 used.
ΔH	BTU/lb	1.5	61 - 64	F4.1	See Note 7.
HRS (Hours)		4880.0	65 - 70	F6.1	
CFM (Air Volume)	ft^3/min	71340.0	71 - 78	F8.1	
Card Number	N/A	93	79 - 80	I2	93 must be inputted for each building.

ENERGY CONTROL SYSTEM
COMPUTER PROGRAM
DATA INPUT INSTRUCTIONS
AND SHEETS

3. BUILDING INFORMATION, CARD 4

Field Name	Units	Input Example	Columns	Field Length	Remarks
BLD NO. (Building Number)	N/A	00200	1 - 5	I5	
EQUIPMENT					
AHU - in		000	6 - 8	I3	"IN" indicates No. of units located
- out		006	9 - 11	I3	inside mechanical room.
CHILLERS - in		001	12 - 14	I3	"OUT" indicates No. of units remote
- out		000	15 - 17	I3	from mechanical room.
EXH. FANS - in		000	18 - 20	I3	
- out		002	21 - 23	I3	
DAMPERS - in		000	24 - 26	I3	
- out		001	27 - 29	I3	
SCHEME 8 DEMAND REDUCTION	KW	2500.00	30 - 35	F6.1	The load reduction in KW as a result of equipment shutoff during peak load hours. Data must be provided when scheme 8 used.
EST TOTAL CABLE LENGTH	FT	0.0	36 - 43	F8.1	The estimated length of coax cable required to connect a building to the ECS.
ICS	N/A	1	44	I1	0 = No cooling
IHS	N/A	1	45	I1	1 = Bldg. CLOAD/HLOAD not known 2 = Bldg CLOAD/HLOAD known (If = 2 CLOAD/HLOAD must be inputted.
CLOAD (Known Cooling Load)	KBTU/sq ft/yr	83.1	46 - 53	F8.1	Known cooling load of building Must be inputted if ICS = 2)

3. BUILDING INFORMATION, Card 4 (Cont'd)

Field Name	Units	Input Example	Columns	Field Length	Remarks
HLOAD (Known Heating Load)	KBTU/sq. ft/yr	34.1	54 - 61	F8.1	Known heating load of building (Must be inputted if IHS = 2).
PR (Percent Reduction of Outside Air)	%/100	0.7	62 - 65	F4.2	For Scheme 3 only (Must be inputted if used.)
Card Number	N/A	94	79 - 80	I2	94 must be inputted for each building.

TABLE I

LOCATION NO.	CITY	LOCATION NO.	CITY
001	Abilene, Texas	029	Miami, Florida
002	Albuquerque, New Mexico	030	Minneapolis, Minnesota
003	Amarillo, Texas	031	Montgomery, Alabama
004	Atlanta, Georgia	032	Nashville, Tennessee
005	Bakersfield, California	033	New Orleans, Louisiana
006	Billings, Montana	034	New York, New York
007	Boston, Massachusetts	035	North Platte, Nebraska
008	Brownsville, Texas	036	Oklahoma City, Oklahoma
009	Casper, Wyoming	037	Phoenix, Arizona
010	Charleston, South Carolina	038	Raleigh, North Carolina
011	Chicago, Illinois	039	Red Bluff, California
012	Columbus, Ohio	040	Reno, Nevada
013	Denver, Colorado	041	Rochester, New York
014	El Paso, Texas	042	Sacramento, California
015	Fargo, North Dakota	043	St. Louis, Missouri
016	Ft. Smith, Arkansas	044	Salt Lake City, Utah
017	Ft. Worth, Texas	045	San Antonio, Texas
018	Fresno, California	046	San Francisco, California
019	Hatteras, North Carolina	047	Sault Sante Marie, Michigan
020	Houston, Texas	048	Seattle, Washington
021	Jackson, Mississippi	049	Shreveport, Louisiana
022	Jacksonville, Florida	050	Tallahassee, Florida
023	Kansas City, Missouri	051	Tampa, Florida
024	Knoxville, Tennessee	052	Tucson, Arizona
025	Laredo, Texas	053	Washington, DC
026	Los Angeles, California	054	Winslow, Arizona
027	Las Vegas, Nevada	055	Yuma, Arizona
028	Memphis, Tennessee		

TABLE II

BUILDING TYPE NO	BUILDING TYPE	BUILDING TYPE NO.	BUILDING TYPE
001	Enlisted Men's Recreational Ctr.	011	Library
002	Theater	012	Office Building
003	Bowling Alley	013	Laboratory (oil)
004	NCO Club	014	Labotatory (gas)
005	Post Exchange	015	Barracks
006	Commissary	016	BOQ
007	Enlisted Men's Mess	017	Machine Shop (See
008	Laundry	018	Warehouse Note 4)
009	Field House (See Note 3)	019	Dental Clinic
010	Chapel		

*NOTE: An additional 91 building type spaces have been alloted (totaling 100 buildings altogether) in each energy savings sheme list (Schemes 1, 2 3, and 4), such that, buildings different than the first 19 buildings may be added to the energy saving scheme lists along with the respective heating and cooling savings in KBUT's per Ft^2 per year.

General Notes

1. The program as structured can analyze up to 120 buildings.

2. Abbreviated units used: C = 10^2, K = 10^3, M = 10^6, G = 10^9.

3. Building types 8 and 9 require estimated cooling energy savings to be provided for Schemes 1, 2 and 4, and for Scheme 3, estimated heating and cooling energy savins must be provided, otherwise zero energy savings are assumed.

4. Building types 17 and 18 require estimated cooling energy savings to be provided for Scheme 4, and for Scheme 3, estimated heating and cooling energy savings must be provided, otherwise zero energy savings are assumed.

5. Some installations may be able to use an existing computer or to tie into another installation's computer. Thus, a zero or nominal cost may be assessed.

6. Right justify integer numeric characters, (I4, 000), and left justify alpha characters (AG, FY 77). All real numeric characters (i.e., F6.2, 500.00) must have the decimal point placement inputted.

7. Example for Scheme 6.

Assume supply air temperature can be reset an average of 6^{o}F higher than normal for the total number of hours that the chiller is operating. Annual chiller sun time is 4,880 hours. The psychrometric conditions of the system indicate that the enthalpy difference between normal supply air temperature and the reset temperature is 1.5 BTU/lb. The total air quantity is 142,680 cfm. Assume that half the air passes through the cooling coil and half through the heating coil.

GENERAL INPUT DATA - CARD 1

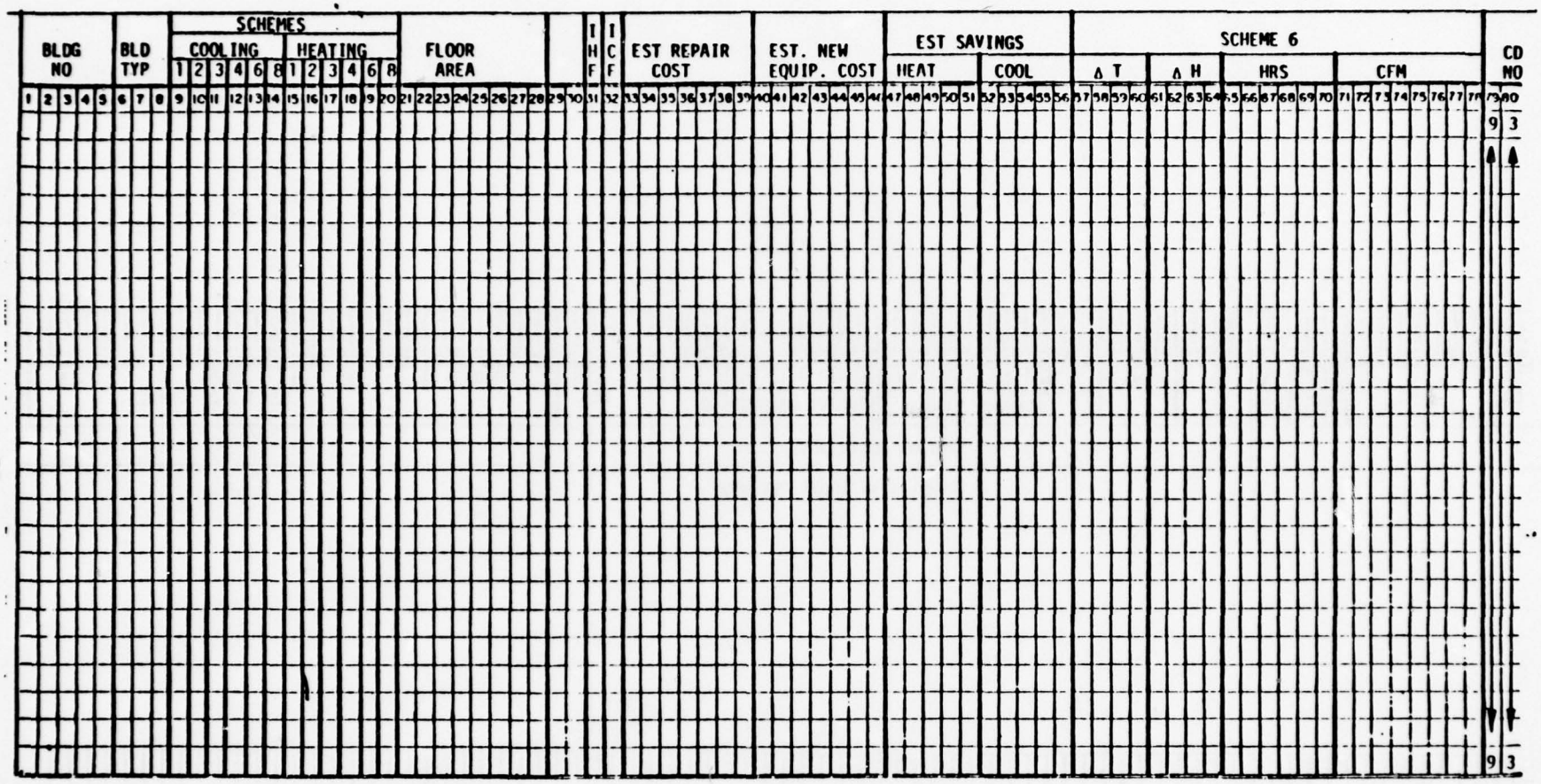
LOC	INSTALLATION	FISCAL YEAR	DATE: MONTH	DATE: DAY	DATE: YR	CURR YEAR	EXP YR OPR	ECS YEARLY OPER COST	EST. CENT CON. INSTALL. COST	COM	CD NO
1 2 3	4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28	29 30 31 32	33 34 35 36 37 38 39 40 41 42 43	44 45 46 47	48 49 50 51	52 53 54 55	56 57 58 59	60 61 62 63 64 65 66 67 68	69 70 71 72 73 74 75 76 77	78	79 80
		F Y		.							9 1

GENERAL INPUT DATA - CARD 2

ENERGY COST LIST: ELEC	GAS	OIL	DEMAND	INT RATE	ESCALATION FACTORS: DISCOUNTED PAYBACK: ELE 1	GAS 1	OIL 1	SIMPLE PAYBACK: ELE 2	GAS 2	OIL 2	EFM	EFO	Equipment Escalation Factor	CC	CD NO
1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21	22 23 24 25 26 27 28	29 30 31 32	33 34 35 36 37	38 39 40 41	42 43 44 45	46 47 48 49	50 51 52 53 54	55 56 57	58 59 60	61 62 63 64	65 66 67 68	69 70	71 72 73 74 75 76 77 78	79 80
															9 2

19

BUILDING INPUT DATA - CARD 3



BUILDING INPUT DATA - CARD 4

BLDG NO	BUILDING EQUIPMENT								SCHEME 8	EST TOTAL CABLE LENGTH	ICS	IIS	KNOWN COOLING LOAD	KNOWN HEATING LOAD	PERCENT REDCT. SCHEME 3		CD NO
	AHU		CHILLERS		EXH FANS		DAMPERS		DEMAND REDUCTION								
	IN	OUT	IN	OUT	IN	OUT	IN	OUT									
1 2 3 4 5	6 7 8	9 10 11	12 13 14	15 16 17	18 19 20	21 22 23	24 25 26	27 28 29	30 31 32 33 34 35	36 37 38 39 40 41 42	43	44 45	46 47 48 49 50 51 52 53	54 55 56 57 58 59 60 61	62 63 64 65	66 67 68 69 70 71 72 73 74 75 76 77 78	79 80
																	9 4
																	9 4

APPENDIX B - PROGRAM LISTING

Copies of the Program listing are available at

USA Facilities Engineering Support Agency
Research and Technology Division
Fort Belvoir, VA 22060

```
PROGRAM TABLD     74/74  OPT=0 TRACE DEBUG          FTN 4.6+420      86/28/77  10.08.22     PAGE    1

      1              PROGRAM TABLD(INPUT=65,TAPE10=65,TAPE20=65,TAPE30=65,TAPE40=65,TAP
                    1E50=65,TAPE60=65,TAPE70=65,TAPE80=65,OUTPUT,TAPE5=INPUT,TAPE6=OUTP
                    2UT,DEBUG=OUTPUT)
                C
                C        PROGRAM LOADS TABLES FOR ENERGY CONTROL SYSTEM
      5         C        FROM CARDS TO DISK FILES
                C
                      DIMENSION INPUT(78)
                1     READ(5,5)INPUT,KARDNO
                      IF(EOF(5))90,3
     10             5 FORMAT(78A1,I2)
                3     IF (KARDNO.LT.1.OR.KARDNO.GT.8) GO TO 6
                      GO TO (10,20,30,40,50,60,70,80),KARDNO
                6     WRITE(6,7)
                7     FORMAT(1H0,*CARD NUMBER NOT 1-8*)
     15               GO TO 90
                C
                C
                     10 WRITE(10,11) (INPUT(L),L=1,49)
                     11 FORMAT(49A1)
     20                 GO TO 1
                     20 WRITE(20,21) (INPUT(L),L=1,74)
                     21 FORMAT(74A1)
                        GO TO 1
                     30 WRITE(30,31)(INPUT(L),L=1,17)
23   25                31 FORMAT(17A1)
                        GO TO 1
                     40 WRITE(40,41)(INPUT(L),L=1,74)
                     41 FORMAT(74A1)
                        GO TO 1
     30                 50 WRITE(50,51) (INPUT(L),L=1,16)
                        51 FORMAT(16A1)
                           GO TO 1
                        60 WRITE(60,61) (INPUT(L),L=1,58)
                        61 FORMAT(58A1)
     35                    GO TO 1
                        70 WRITE(70,71) (INPUT(L),L=1,69)
                        71 FORMAT(69A1)
                           GO TO 1
                        80 WRITE(80,81) (INPUT(L),L=1,33)
     40                 81 FORMAT(33A1)
                           GO TO 1
                        90 STOP
                           END


          SYMBOLIC REFERENCE MAP (R=3)

    ENTRY POINTS      DEF LINE      REFERENCES
      3645  TABLD          1
```

```
      PROGRAM ENGCTL(INPUT=65,OUTPUT=65,TAPE10=65,TAPE20=65,TAPE30=65,TA
     1PE40=65,TAPE50=65,TAPE60=65,TAPE70=65,TAPE80=65,TAPE5=INPUT,TAPE6=
     2OUTPUT)
C
      DIMENSION    HPIE(120),  CPIE(120)
      DIMENSION BAL(10,120),BCS(5,120),BCT(120,5),
     1          BHS(5,120),BTYS(120),BWC(120),CC(5),CCC(120,5),CFM(120),
     2          CHC(2,2,5),CL(120),CRM(120,5),CRP(120,5),CSF(4,120),
     3          CTYS(120,5),DH(120),DR(120),DPP(120),DT(120),EC(4),
     4          ECSB(10,120),ECT(3),EESC(120),EESH(120),ENC(120),
     5          ENC(120,5),HR(120),HSF(4,120),IDCP(4,7,120),IDTN(120),
     5          ICDD(100),ICF(120),ICITY(9,100),IEQ(2,4,120),IFSYR(5),
     7          IHDD(100),IHF(120),INDEX(120),INSTAL(6),IRPR(4,4,6),
     8          ISCC(6,120),ISCH(6,120),ITEQ(120),ITIN(120),ITOUT(120)
      DIMENSION MIRP(2,5),NBN(120),NBT(120),
     1          NDATE(18),NPP(120,5),NOCP(5,120),
     2          OC(10,120),OMCH(10,120),PC(6,5),PCT(120,5),PD(120),
     3          RC(120),REC(2,4,5),RPC(4,5),SQFT(120),TCC(5),
     4          TCS(120),TDCS(120),TDHS(120),TEC(120,5),
     5          TECS(120,5),THC(120),TPC(5),TRP(120,5),TTDCS(120),
     6          TTDHS(120),WLC(24),WC(4,120),YCS(10,120),YEF(3,2),
     7          HLOAD(120),YHS(10,120),              ZMC(10,120),
     8          PR(120),ICS(120),CALPS(120),HALPS(120),CLOAD(120)
      DIMENSION SUM1(120),SUM2(120),SUM3(120),SUM4(120),SUM5(120),
     1          LUM1(120),LUM2(120),THS(120)
      DIMENSION   BEE(10,120), ZEE(10,120), DEE(10,120), FEE(10,120),
     1  SET(120),SAP(120),TAP(120)
      DATA IPK/4H    /,IM/07/,IDCP/3360*07
C
C                         ENERGY COST SYSTEM
C
C       THIS PROGRAM HAS THE CAPABILITY OF DETERMINING THE EXPECTED
C       ENERGY SAVINGS FOR AN INDIVIDUAL BUILDING FOR EACH TYPE OF
C       CONTROL SCHEME AND THEN PROCEED WITH AN ECONOMIC
C       ANALYSIS BASED ON EITHER LIFE CYCLE OR PRESENT WORTH METHOD.
C
C                              SYMBOL DEFINITIONS
C
C     INPUT TABLES
C
C       LN     = LOCATION NO.
C       ICITY  = CITY
C       IHDD    = HEATING DEGREE DAYS
C       ICDD    = COOLING DEGREE DAYS
C       IBTN    = BUILDING TYPE NO.
C       HSF     = HEATING SAVINGS FACTOR
C       CSF     = COOLING SAVINGS FACTOR
C       IRPR    = REMOTE POINT REQUIREMENTS
C       WLC     = LOCAL WIRING COST
C       BC      = BRANCHING COST
C       CPF     = COAX CABLE COST PER FT
C       CPP     = COAX CABLE COST PER PANEL
```

```
C       YEP     = YEARLY ESCALATION FACTORS
C       EFM     = MAINTENANCE ESCALATION FACTOR
C       EFO     = OPERATING ESCALATION FACTOR
C       IYEAR   = YEAR ESCALATION FACTOR BEGINS
C       CC      = CONSOLE COST
C       PC      = PROGRAM COST
C       RPC     = REMOTE POINT COST
C       REC     = REMOTE COMMUNICATION (TELEPHONE = 1, COAX CABLE = 2
C       CHC     = CHANNEL COST
C
C     GENERAL INPUT SYSMBOL DEFINITIONS
C
C       ILN     = LOCATION NUMBER
C       INSTAL  = INSTALLATION
C       IFSYR   = FISCAL YEAR
C       FC      = ENERGY COST LIST
C       ICY     = CURRENT YEAR
C       IEYO    = EXP YEAR OPERATION
C       ICT     = COMMUNICATION TYPE (2=COAX CABLE, 1=TELEPHONE)
C       RINT    = RATE OF INTEREST
C       YOC     = EGS YEARLY OPERATIOG COST
C       CCIC    = EST. CENTRAL CONSOLE INSTALLATION COST
C       NDATE   = DATE
C
C       BUILDING INPUT SYMBOL DEFINITIONS
C
C       CALPS   = ASSUMED COOLING LOAD/SQ.FT.
C       HALPS   = ASSUMED HEATING LOAD/SQ.FT.
C       NBN     = BLD NO.
C       NBT     = BLD TYPE
C       ISCH    = SCHEME REQUESTED
C       SQFT    = SQUARE FOOTAGE (FLOOR AREA)
C       IHF     = HEATING FUEL TYPE
C       ICF     = COOLING FUEL TYPE
C       IHS     = HEATING SCHEMES
C       ICS     = COOLING SCHEMES
C       RC      = REPAIR COST
C       ENC     = EST NEW EQUIP COST
C       ESH     = EST ENERGY HTG SAVINGS COST
C       ESC     = EST ENERGY SAVINGS COOLING COST
C       DT      = TEMPERATURE DIFFERENCE
C       DH      = ENTHALPY DIFFERENCE
C       HR      = HOURS (SCHEME 6)
C       CFM     = CFM (SCHEME 6)
C       IEQ     = EQUIPMENT TOTALS
C       DR      = DEMAND REDUCTION
C       CL      = CABLE LENGTH
C       HLOAD   = KNOWN HEATING CONSUMPTION
C       CLOAD   = KNOWN COOLING CONSUMPTION
C       PR      = PERCENT REDUCTION
C
C
      100   READ(IC,101)L,(ICITY(I,L),I=1,9),IMOD(L),ICOD(L)
```

```
                      IF(EO (10))105,100
                  101 FORMAT(I3,9A4,2I5)
                C
      110         105 L=1
                  110 READ(20,111) IBTN(L),CALPS(L),HALPS(L),(HSF(I,L),CSF(I,L),
                     1    I=1,3),CSF(4,L)
                      HSF(4,L)=0.0
                  111 FORMAT(I3,15X,2F8.0,5X,7F5.2)
      115             IF(EOF(20))120,112
                  112 L=L+1
                      GO TO 110
                C
                  120 L=0
      120         130 L=L+1
                      READ(30,131)I,(((IRPR(K,J,L),K=1,4),J=1,4)
                      IF(EOF(30))130,132
                  131 FORMAT(17I1)
                  132   IF (L.EQ.1.AND.I.EQ.1)GO TO 130
      125               IF (L.EQ.2.AND.I.EQ.2) GO TO 130
                        IF (L.EQ.3.AND.I.EQ.3) GO TO 130
                        IF (L.EQ.4.AND.I.EQ.4) GO TO 130
                        IF (L.EQ.5.AND.I.EQ.6) GO TO 130
                        IF (L.EQ.6.AND.I.EQ.8) GO TO 150
      130               WRITE(6,141)
                  141 FORMAT(/,* CARD #3 NOT IN SCHEME ORDER*)
                      GO TO 3000
29              C
                C
      135         150 READ(40,151) (WLC(K),K=1,23,2),DC,CPF,CPP
                      IF(EOF(40))190,152
                  151   FORMAT(13F5.2,F4.2,F5.2)
                  152   DO 160 K=2,24,2
                  160   WLC(K) = WLC(K-1)
      140             190 READ(60,191) M,(CC(M),(PC(I,M),I=1,6))
                      191 FORMAT(I1,F9.2,6F8.2)
                          IF(EOF(60))200,190
                      200 READ(70,211) M,((RPC(L,M),L=1,4),(REC(1,L,M),L=1,3),
                     1      (REC(2,L,M),L=1,2))
      145             211 FORMAT(I1,4F7.2,5F8.2)
                          IF(EOF(70))220,200
                      220 READ(80,231) M,(((CHC(K,L,M),K=1,2),L=1,2)
                      231 FORMAT(I1,4F8.2)
                          IF(EOF(80))300,220
      150             300 READ(5,250)  NOR
                      250 FORMAT(I2)
                          DO 3111 NRR = 1, NOR
                C
                C
      155       C     READ IN GENERAL INPUT DATA
                C
                          READ(5,301) LN,(INSTAL(L),L=1,6),IFSYR,(NDATE(L),L=1,10),ICY,
                     1        IEYD,YDC,CCIC,ICI,KARDIP,KARUNO
                      301 FORMAT(I3,6A4,1X,5A1,10A1,2I4,2F9.2,3I1)
```

```
      WRITE(6,301) LN,(INSTAL(L),L=1,6),IFSYR,(NDATE(L),L=1,18),ICY,
     1         IEYO,YOC,CCIC,ICT,KARDTP,KARDNO
      IF (KARDTP.EQ.9.AND.KARDNO.EQ.1) GO TO 320
      WRITE(6,311)
  311 FORMAT(/,* CARD TYPE NOT = 91*)
      GO TO 3000
  320 READ(5,331) (EC(K),K=1,4),RINT,((YEF(K,L),K=1,3),L=1,2),
     1EFM,EFO,EFE,I6,KARDTP,KARDNO
  331 FORMAT(4F7.4,F5.2,8F4.2,F4.2,I1,8X,2I1)
      WRITE(6,331) (EC(K),K=1,4),RINT,((YEF(K,L),K=1,3),L=1,2),
     1EFM,EFO,EFE,I6
      RINT=RINT/100.
      IF (KARDTP.EQ.9.AND.KARDNO.EQ.2) GO TO 350
      WRITE(6,341)
  341 FORMAT(/,* CARD TYPE NOT = 92*)
      GO TO 3000
C
C                 READ IN BUILDING INPUT DATA
C
  350 J=0
  360 J=J+1
      READ(5,361) NBN(J),NBT(J),(ISCC(I,J),I=1,6),(ISCH(I,J),I=1,5),
     1    SOFT(J),IHF(J),ICF(J),IRC,NEC,EESH(J),EESC(J),DT(J),
     2    DH(J),HR(J),CFM(J),KARDTP,KARDNO
      IF(EOF(5))450,362
  361 FORMAT(I5,I3,12I1,F8.0,2X,2I1,2I7,2F5.3,2F4.1,F6.1,F8.1,2I1)
  362 WRITE(6,361)NBN(J),NBT(J),(ISCC(I,J),I=1,6),(ISCH(I,J),I=1,5),
     1    SOFT(J),IHF(J),ICF(J),IRC,NEC,EESH(J),EESC(J),DT(J),
     2    DH(J),HR(J),CFM(J),KARDTP,KARDNO
      IF(IHF(J).EQ.0) IHF(J)=3
      IF (ICF(J) .EQ. 0) ICF(J) = 1
      RC(J)=IRC
      ENC(J)=NEC
      IF (KARDTP.EQ.9.AND.KARDNO.EQ.3) GO TO 380
      WRITE(6,371)
  371 FORMAT(/,* CARD TYPE NOT = 93*)
      GO TO 3000
  380 IBH=NBN(J)
      READ(5,391)          NBN(J),(((IEQ(I,K,J),I=1,2),K=1,4),DR(J),
     1    CL(J),ICS(J),IHS(J),CLOAD(J),HLOAD(J),PR(J),KARDTP,KARDNO
  391 FORMAT(I5,8I3,F6.1,F8.1,2I1,2F8.1,F4.2,13X,2I1)
      WRITE(6,391)         NBN(J),(((IEQ(I,K,J),I=1,2),K=1,4),DR(J),
     1    CL(J),ICS(J),IHS(J),CLOAD(J),HLOAD(J),PR(J),KARDTP,KARDNO
      IF(EOF(5))400,12
   12 IF (IBH.EQ.NBN(J)) GO TO 360
  400 WRITE(6,401)
  401 FORMAT(/,* BLD DATA OUT OF ORDER*)
      GO TO 3000
C
C
C                 JMAX = TOTAL NUMBER OF BLDGS
  450 JMAX=J-1
C                 ENERGY CONVERSION TABLE TO KBTUBS
```

```
C      (1) = 1KWH ELECTRICTY
C      (2) = 1CCF NATURAL GAS
C      (3) = 1 GAL FUEL OIL
C
      ECT(1)=3.41
      ECT(2)=101.
      ECT(3)=143.1
C
C
C           INDEX DEFINITIONS
C     I = SCHEME
C     J = BLDG
C     M = MANUFACTURE
C
C
C     ZERO OUT TABLES
C
      CTC = 0.0
      HTC = 0.0
      IF (IYEAR.GT.0) GO TO 15
      IYEAR = 1980
   15 DO 480 J = 1,120
      TTDHS(J) = 0.0
      TTDCS(J) = 0.0
      TDHS(J) = 0.0
      TDCS(J) = 0.0
      PD(J) = 0.0
      DO 460 I=1,5
      BCS(I,J)=0.0
      BHS(I,J)=0.0
  460 THS(J)=0.0
      TCS(J) = 0.0
      DO 465 I = 1,4
      DO 465 K = 1,7
  465 IBCP(I,K,J) = 0
  480 CONTINUE
C
C     HEATING AND COOLING GEOGRAPHIC ADJ BASED ON WASH., D.C.
C
      HGA = IHDD(LN)/4258.0
      CGA = ICDD(LN)/1659.0
C
C     THIS IS THE MAIN LOOP FOR ECS COMPUTATIONS FOR EACH BUILDING
C
C
      DO 700 J=1,JMAX
C
C     BHS = BUILDING HEAT SAVINGS PER SCHEME
C     THS = TOTAL HEAT SAVINGS
C     BCS = BLD COOLING SAVINGS
C     TCS = TOTAL COOLING SAVINGS ( AL. SCHEMES)
C     TDHS = TOTAL DOLLAR HEAT SAVINGS
C     TDCS = TOTAL DOLLAR COOLING SAVINGS
```

```
C     BTYS = OLOG TOTAL DOLLAR YEARLY SAVINGS
C     PD = PEAK DEMAND
C
      L=NBT(J)
  270 C       COOLING CALCULATION
C       ICS = COOLING CALCULATING SCHEME ; IHS = HEATING CALCULATING SCHEME
C        0  =  NO COOLING / HEATING
C        1  =  COOLING (HEATING)  CONSUMPTION NOT GIVEN
C        2  =  COOLING (HEATING)  CONSUMPTION GIVEN
  275       IF(ICS(J).EQ.0) GO TO 4301
            IF( ICS(J).EQ.2)  CPIE(J) = CLOAD(J)
            IF(ICS(J).GT.1) GO TO 4005
C       CALPS = ASSUMED COOLING LOAD / SQFT
C       HALPS = ASSUMED HEATING LOAD / SQFT
  280       CLOAD(J) = SQFT(J)*CALPS(L)/10**5
            CPIE(J) = CLOAD(J)
 4005 DO 4001 I= 1,5
            IF (ISCC(I,J).EQ.0) BCS(I,J) = 0.0
            IF (ISCC(I,J).EQ.0) GO TO 4000
  285       IF (I.EQ.3) GO TO 4010
            IF (I.EQ.5) GO TO 4020
            BCS(I,J) = CLOAD(J)*CSF(I,L)*CGA
            GO TO 4030
 4010 BCS(3,J) = CLOAD(J)*CSF(I,L)*PR(J)*CGA
 4030 CLOAD(J)=CLOAD(J)*(1-CSF(I,L))
  290       GO TO 4040
 4020 BCS(5,J) = 0.0
            BCS(5,J) =  4.5*CFM(J)*DH(J)*HR(J)*.4/10**9
 4040 TCS(J) = TCS(J) + BCS(I,J)
  295 4000 CONTINUE
 4200 TCS(J)=TCS(J)+EESC(J)
            IF (ISCC(6,J).EQ.0) PD(J) = 0.0
            IF(ISCC(6,J).NE.0) PD(J) = DE(J)*.10*EC(4)
            IC = ICE(J)
  300       TOCS(J) = (TCS(J)*EC(IC)/ECT(IC))*10**6
C     HEAT CALCULATION
 4301 CONTINUE
            IF(IHS(J).EQ.0) GO TO 4311
            IF( IHS(J).EQ.2)    HPIE (J) = HLOAD(J)
  305       IF(IHS(J).GT.1) GO TO 4302
            HLOAD(J) = SQFT(J)*HALPS(L)/10**5
            HPIE(J) = HLOAD(J)
 4302 DO 4300 I=1,5
            IF (ISCH(I,J).EQ.0) BHS(I,J) = 0.0
  310       IF (ISCH(I,J).EQ.0) GO TO 4300
            IF (I.EQ.3) GO TO 4320
            IF (I.EQ.4) GO TO 4330
            IF (I.EQ.5) GO TO 4340
            BHS(I,J) = HLOAD(J)*HSF(I,L)*HGA
  315       GO TO 4350
 4320 BHS(3,J) = HLOAD(J)*HSF(I,L)*PR(J)*HGA
            GO TO 4350
 4330 BHS(4,J) = 0.0
```

```
                4350 HLOAD(J)=HLOAD(J)*(1-HSF(I,L))
320                  GO TO 4360
                4340 BHS(5,J) = 0.0
                     BHS(5,J) = CFM(J)*DT(J)*1.08*HR(J)*1.42/10**9
                4360 THS(J) = THS(J) + BHS(I,J)
                4300 CONTINUE
325             4311 CONTINUE
                     CTC = CTC + CPIE(J)
                     HTC = HTC + HPIE(J)
                     IH = IHF(J)
                     TOHS(J) =(THS(J)*EC(IHL/ECT(IH))*10**6
330                  BTYS(J) =  TOCS(J) + TOHS(J) + PO(J)
                C
                C          EQUIPMENT COST
                C
                C       ITEQ = TOTAL NO OF EACH TYPE EQUIPMENT
                C       IBCP = BUILDING CONTROL POINT TABULATION
335             C        ITIN = NO POINTS IN
                C        ITOUT = NO POINTS OUT
                C
                     DO 560 K=1,4
                560 ITEQ(J) = IEQ(1,K,J)+IEQ(2,K,J)+ITEQ(J)
340             C
                     DO 600 I=1,6
                     ISUM = 0
                     IF (ISCH(I,J).EQ.0.AND.ISCC(I,J).EQ.0) GO TO 600
                     DO 590 L=1,4
345                  ISUM = 0
                     DO 580 K=1,4
                     IF(ISCC(5,J).EQ.1.AND.K.EQ.2.AND.L.EQ.2.AND.ISCH(5,J).EQ.1)
                    1GO TO 580
                     IF(ISCC(5,J).EQ.1.AND.K.EQ.2.AND.L.EQ.3.AND.ISCH(5,J).EQ.1)
350                 1GO TO 580
                570 ITIN(J) = (ITIN(J)+(IEQ(1,K,J))*IRPR(L,K,I))
                     ITOUT(J) = (ITOUT(J)+(IEQ(2,K,J))*IRPR(L,K,I))
                580 ISUM = ISUM + ((IEQ(1,K,J) + IEQ(2,K,J))*IRPR(L,K,I))
                590 IBCP(L,I,J) = ISUM
355             600 CONTINUE
                     DO 620  L = 1,4
                     ISUM = 0
                     DO 640  I = 1,6
                640 ISUM = ISUM + IBCP(L,I,J)
360                  622 IBCP(L,7,J) = ISUM
                620 CONTINUE
                C
                C          WIRING COST
                C
365                  IWO=60
                     IWI=30
                C    BRANCH WIRING COST
                     BWC(J) = ITEQ(J)*BC
                     K=ITIN(J)
370                  M=ITOUT(J)
                     IF(K.GT.24) K=24
```

```
      IF(M.GT.24) M=24
      WC(1,J) = WLC(K)*IWI
      WC(2,J) = WLC(M)*IWO
375   WC(3,J) = WC(1,J)+WC(2,J)
      WC(4,J) = WC(3,J)+OWC(J)
C
C     BLOG POINT COST TOTAL
C
380   DO 610 L=1,4
      DO 611 M=1,4
C
610   PCT(J,M) = PCT(J,M)+(RPC(L,M)*IBCP(L,7,J))
      DO 615 L=1,4
385   IF(L.EQ.4)  GO TO 616
      FAT = IBCP(L,7,J)
      NBCP(L,J) =(FAT/4. +.99)
      GO TO 615
616   FAT = IBCP(L,7,J)
390   NBCP(L,J) =(FAT/8. +.99)
615   PCT(J,5)    = PCT(J,5) + (RPC(L,5)*NBCP(L,J))
C
C      NUMBER REMOTE POINT PANELS
C     COMPUTED FOR EACH MANUFACTURER
395   C
      MDM       = ((IBCP(1,7,J)/1) + (IBCP(2,7,J)/1) + (IBCP(3,7,J)/3) +
     1      (IBCP(4,7,J)/3))
      NRP(J,1) =(MDM/23.0 + .99)
C
400   CAZ       = ((2*IBCP(1,7,J))+IBCP(4,7,J))
      NRP(J,2) =(CAZ/32.0 + .99)
      WALT=IBCP(2,7,J)
      ITEMP=(WALT/8. + .99)
      IF (ITEMP.GT.NRP(J,2)) NRP(J,2)=ITEMP
405   VAN = IBCP(3,7,J)
      ITEMP =(VAN/23. + .99)
      IF (ITEMP.GT.NRP(J,2)) NRP(J,2)=ITEMP
C
      PETE      = (IBCP(1,7,J)+IBCP(2,7,J)+IBCP(3,7,J)+IBCP(4,7,J))
410   NRP(J,3) =(PETE/120. + .999)
      NRP(J,4) =(PETE/64.  + .999)
C
C     IF TELEPHONE LINES USED
      DOC                 = ((2*(IBCP(1,7,J)+IBCP(2,7,J)+IBCP(3,7,J)))
415   -     + IBCP(4,7,J))
      IF (ICT.EQ.1) NRP(J,5) =(DOC/496. + .999)
      IF (ICT.EQ.2) NRP(J,5) =(DOC/480. + .999)
C
      DO 661 M=1,5
420   CRP(J,M) = REC(ICT,1,M)*NRP(J,M)
      IF (ICT.EQ.2) GO TO 650
C     TELEPHONE LINES - COST OF REMOTE MODEMS
      CRP(J,M) = REC(1,3,M)*NRP(J,M)
C     TOTAL EQUIPMENT COST
```

```
      TEC(J,M) = CRP(J,M) + CRN(J,M)
C     SUM EQUIPMENT AND WIRING COST FOR TELEPHONE
      EWC(J,M) = WC(4,J)*PCT(J,M)*TEC(J,M)
      GO TO 660
C     COAX CABLE COST
  650 CCC(J,M) = (CL(J)*CPF)*(NRP(J,M)*CPP)
      EWC(J,M) = WC(4,J)*PCT(J,M)*CCC(J,M)
C           BLDG COST TOTAL
  660 BCT(J,M) = EWC(J,M) + RC(J) + ENC(J)
  661 IF (BCT(J,M).EQ.0.) BCT(J,M) = 1000.01
  700 CONTINUE
C           PRINT REPORTS 1-9
C
      N=0
      DO 950 NN=1,12
      N=N+1
      IF(N.EQ.13)GO TO 901
      M17=1
      IF(N.EQ.10.AND.ICT.EQ.2) N=11
      IF(N.EQ.11.AND.ICT.EQ.1) N=12
      IF(N.GT.8) M17=5
      DO 900 M=1,M17
  702 LC=57
      DO 703 J=1,JMAX
      SUM1(J)=0.0
  703 SUM2(J)=0.0
      DO 900 J=1,JMAX
      IF(LC.LT.56) GO TO 730
      CALL ENGHED(N,NDATE,IFSYR,INSTAL,M)
      LC=11
  730 GO TO(740,740,740,740,760,770,790,810,830,850,870,890),N
C
C
C                 REPORT 1    ENERGY SAVING LIST SCHEME1-4
  740 IF (ISCH(N,J).EQ.0.AND.ISCC(N,J).EQ.0) GO TO 745
      L=NBT(J)
      WRITE(6,741) NBN(J),NBT(J),SQFT(J),HSF(N,L),HGA,DHS(N,J),
     1     CSF(N,L),CGA,DCS(N,J)
  741 FORMAT(/,9X,I5,7X,I3,4X,F8.1,8X,F5.2,8X,F7.3,6X,F7.3,8X,F5.2,8X,
     1      F6.3,7X,F7.3)
  745 IF(J.GT.1) GO TO 744
      SUM1(J)=DHS(N,J)
      SUM2(J)=DCS(N,J)
      GO TO 743
  744 SUM1(J)=SUM1(J-1)+DHS(N,J)
      SUM2(J)=SUM2(J-1)+DCS(N,J)
      IF(J.EQ.JMAX) GO TO 746
      IF (ISCH(N,J).EQ.0.AND.ISCC(N,J).EQ.0) GO TO 900
      IF(J.NE.JMAX) GO TO 743
  746 WRITE(6,742) SUM1(JMAX),SUM2(JMAX)
  742 FORMAT(/,70X,F7.3,34X,F7.3)
  743 GO TO 899
C
```

```
C          REPORT 2  ENERGY SAVING LIST - SCHEME 6
      760 IF (ISCH(N,J).EQ.0.AND.ISCC(N,J).EQ.0) GO TO 765
          WRITE(6,761) NBN(J),NBT(J),CFM(J),HR(J),DT(J),BHS(N,J),DH(J),
     1       BCS(N,J)
      761 FORMAT(/,9X,I5,2X,I3,10X,F8.1,8X,F6.1,6X,F5.1,8X,F8.1,10X,F5.1,
     1       11X,F8.3)
      765 IF(J.GT.1) GO TO 764
          SUM1(J)=BHS(N,J)
          SUM2(J)=BCS(N,J)
          GO TO 763
      764 SUM1(J)=SUM1(J-1)+BHS(N,J)
          SUM2(J)=SUM2(J-1)+BCS(N,J)
          IF(J.EQ.JMAX) GO TO 766
          IF (ISCH(N,J).EQ.0.AND.ISCC(N,J).EQ.0) GO TO 900
          IF(J.NE.JMAX) GO TO 763
      766 WRITE(6,762) SUM1(JMAX),SUM2(JMAX)
      762 FORMAT(/,75X,F8.3,26X,F8.3)
      763 GO TO 899
C
C          REPORT 3  YEARLY BLDG ENERGY SAVINGS
      770 WRITE(6,771) NBN(J),THS(J),TDHS(J),TCS(J),TDCS(J),DR(J),
     1PD(J),BTYS(J),CPIF(J),APIF(J)
      771 FORMAT(/,3X,I5,4X,F8.3,7X,F8.2,3X,F9.3,6X,F8.2,6X,F7.1,6X,F7.2,5X,
     1       F11.2, 6X,F6.3,6X,F6.3)
          IF(J.GT.1) GO TO 774
          SUM1(1)=THS(J)
          SUM2(1)=TDHS(J)
          SUM3(1)=TCS(J)
          SUM4(1)=TDCS(J)
          SUM5(1)=BTYS(J)
          GO TO 773
      774 SUM1(J)=SUM1(J-1)+THS(J)
          SUM2(J)=SUM2(J-1)+TDHS(J)
          SUM3(J)=SUM3(J-1)+TCS(J)
          SUM4(J)=SUM4(J-1)+TDCS(J)
          SUM5(J)=SUM5(J-1)+BTYS(J)
          IF(J.NE.JMAX) GO TO 773
          WRITE(6,772) SUM1(JMAX),SUM2(JMAX),SUM3(JMAX),SUM4(JMAX),
     1SUM5(JMAX),CTC,HTC
      772 FORMAT(/,3X,'TOTAL',4X,F8.3,5X,F8.0,5X,F9.3,4X,F8.0,33X,F11.2,
     1,4X,F6.1,6X,F6.1)
      773 GO TO 899
C
C          REPORT 4  BLDG CONTROL POINT TABULATION
      790 DO 800 I=1,6
          IF (ISCH(I,J).EQ.0.AND.ISCC(I,J).EQ.0) GO TO 800
          II=I
          IF(I.EQ.5) II=6
          IF(I.EQ.6) II=8
          IF(NBN(J).NE.NB) WRITE(6,791) NBN(J),II,(IBCP(L,I,J),L=1,4)
      791 FORMAT(/,12X,I5,12X,I2,14X,I3,15X,I3,12X,I3,13X,I3)
          IF(NBN(J).EQ.NB) WRITE(6,792) IOK,II,(IBCP(L,I,J),L=1,4)
```

```
      792 FORMAT(13X,A4,12X,I2,14X,I3,15X,I3,12X,I3,13X,I3)
          NB=NBN(J)
          LC=LC+1
      800 CONTINUE
  535     WRITE(6,801) (IBCP(L,7,J),L=1,4)
      801 FORMAT(27X,*TOTAL*,13X,I3,15X,I3,12X,I3,13X,I3)
          LC=LC+2
          LUM1(1)=IBCP(1,7,J)
          DO 803 L=2,4
  540     803 LUM1(L)=LUM1(L-1)+IBCP(L,7,J)
          IF(J.GT.1) GO TO 802
          LUM2(1)=LUM1(4)
          GO TO 804
      802 LUM2(J)=LUM2(J-1)+LUM1(4)
  545     IF(J.NE.JMAX) GO TO 804
          WRITE(6,805) LUM2(JMAX)
      805 FORMAT(/,84X,*TOTAL*,12X,I4)
      804 GO TO 899
C
  550 C           REPORT 5    LOCAL WIRING COST
      810 K=ITIN(J)
          KK=ITOUT(J)
          IF(K.GT.24) K=24
          IF(KK.GT.24) KK=24
  555     WRITE(6,811) NBN(J),ITEQ(J),BC,BWC(J),ITIN(J),IWI,WLC(K),
         1       ITOUT(J),IWO,WLC(M),WC(3,J),WC(4,J)
      811 FORMAT(/,9X,I5,6X,I3,7X,F6.2,5X,F7.2,4X,I3,3X,I3,5X,F6.2,7X,I3,3X,
         1       I3,7X,F6.2,4X,F7.2,3X,F8.2)
          IF(J.GT.1) GO TO 812
  560     SUM1(1)=WC(4,J)
          GO TO 813
      812 SUM1(J)=SUM1(J-1)+WC(4,J)
          IF(J.NE.JMAX) GO TO 813
          WRITE(6,814) SUM1(JMAX)
  565 814 FORMAT(/,101X,*TOTAL*,9X,F8.2)
      813 GO TO 899
C
C           REPORT 6    REMOTE ST COST TOTALS
      830 WRITE(6,831) NBN(J),(IBCP(L,7,J),RPC(L,M),L=1,4),PCT(J,M)
  570 831 FORMAT(/,,0X,I5,47X,I3,6X,F7.2),5X,F8.2)
          IF(J.GT.1) GO TO 832
          SUM1(1)=PCT(J,M)
          GO TO 834
      832 SUM1(J)=SUM1(J-1)+PCT(J,M)
  575     IF(J.NE.JMAX) GO TO 834
          WRITE(6,833) SUM1(JMAX)
      833 FORMAT(/,95X,*TOTAL*,10X,F10.2)
      834 GO TO 899
C
  580 C           REPORT 7     TELEPHONE LINE EQUIP COST
      850 WRITE(6,851) NBN(J),NRP(J,M),REC(1,1,M),CRP(J,M),NRP(J,M),
         1       REC(1,3,M),CRM(J,M),TEC(J,M)
      851 FORMAT(/,9X,I5,11X,I2,11X,F8.2,7X,F8.2,11X,I2,11X,F8.2,7X,F8.2,7X,
```

```
     1     F9.2)
585           IF(J.GT.1) GO TO 852
              SUM1(1)=TEC(J,M)
              GO TO 854
          852 SUM1(J)=SUM1(J-1)+TEC(J,M)
              IF(J.NE.JMAX) GO TO 854
590           WRITE(6,853) SUM1(JMAX)
          853 FORMAT(/,99X,*TOTAL*,9X,F10.2)
          854 GO TO 899
C
C          REPORT 8   COAX CABLE
595       870 WRITE(6,871) NAN(J),CL(J),CPF,NRP(J,M),CPP,CCC(J,M)
          871 FORMAT(/,13X,I5,13X,F8.1,13X,F6.2,15X,I2,18X,F7.2,10X,F9.2)
              IF(J.GT.1) GO TO 872
              SUM1(1)= CCC(J,M)
              GO TO 874
600       872 SUM1(J)=SUM1(J-1)+CCC(J,M)
              IF(J.NE.JMAX) GO TO 874
              WRITE(6,873) SUM1(JMAX)
          873 FORMAT(/,91X,*TOTAL*,13X,F10.2)
          874 GO TO 899
605       C
C          REPORT 9  BLDG COST TOTAL
          890 IF (BCT(J,M).EQ.1000.01) GO TO 8001
              WRITE(6,891) NAN(J),FWC(J,M),RC(J),ENC(J),BCT(J,M)
          891 FORMAT(/,13X,I5,10X,F9.2,10X,F10.2,8X,F10.2,9X,F10.2)
610           GO TO 8003
         8001 WRITE(6,8002)NAN(J),FWC(J,M),RC(J),ENC(J),BCT(J,M)
         8002 FORMAT(/,13X,I5,10X,F9.2,10X,F10.2,8X,F10.2,2X,*DEFAULT *,F10.2)
         8003 IF(J.GT.1) GO TO 892
              SUM1(1)=FWC(J,M)
              SUM2(1)=RC(J)
615           SUM3(1)=ENC(J)
              SUM4(1)=BCT(J,M)
              GO TO 894
          892 SUM1(J)=SUM1(J-1)+FWC(J,M)
620           SUM2(J)=SUM2(J-1)+RC(J)
              SUM3(J)=SUM3(J-1)+ENC(J)
              SUM4(J)=SUM4(J-1)+BCT(J,M)
              IF(J.NE.JMAX) GO TO 894
              WRITE(6,893) SUM1(JMAX),SUM2(JMAX),SUM3(JMAX),SUM4(JMAX)
625       893 FORMAT(/,13X,*TOTAL*,10X,F9.0,10X,F10.2,8X,F10.2,9X,F10.0)
          894 CONTINUE
C
          899 LC=LC+2
          900 CONTINUE
630       901 CONTINUE
          950 CONTINUE
C
C
C
635       C
              DO 980 M=1,5
```

```
                      DO 970 I=1,6
                      KIP=0
                      DO 969 J=1,JMAX
      640             IF(KIP.EQ.1) GO TO 969
                      IF (ISCH(I,J).EQ.0.AND.ISCC(I,J).EQ.0) GO TO 969
                      TPC(M) = TPC(M)+PC(I,M)
                      KIP=1
                  969 CONTINUE
      645             970 CONTINUE
                  C   TOTAL CONSOLE COST
                      IF(ICT.EQ.1) TCC(M) = CC(M)*16+TPC(M)+REC(ICT,2,M)+CCIC
                      IF(ICT.EQ.2) TCC(M) = CC(M)*16+TPC(M)+CCIC
                  980 CONTINUE
      650         C
                  C
                  C   SORT AN INDEX TABLE OF BLOCKS IN DESCENDING ORDER BY MINIMUM
                  C   TOTAL COST PER BUILDING
                  C
      655             DO 1030 M=1,5
                      DO 1000 J6=1,JMAX
                      CTYS(J6,M) = (BCT(J6,M) - BTYS(J6))/BCT(J6,M)
                      INDEX(J6)=J6
                 1000 CONTINUE
      660             DO 1030 I=1,JMAX
                      DUMY =  99999999
                      IHOLD=I
                      DO 1010 J6=I,JMAX
                      IF(DUMY.LT.CTYS(J6,M)) GO TO 1010
      665             DUMY = CTYS(J6,M)
                      IHOLD=J6
                 1010 CONTINUE
                      IN=INDEX(I)
                      INDEX(I)=INDEX(IHOLD)
      670             INDEX(IHOLD)=IN
                      F=CTYS(I,M)
                      CTYS(I,M)=CTYS(IHOLD,M)
                      CTYS(IHOLD,M)=F
                 1030 CONTINUE
      675         C
                  C
                  C   GENERAL DISCOUNT PAYBACK PERIOD CALCULATIONS
                  C
                  C        MAXIMUM NO. OF PANELS PER CHANNEL
      680         C
                      MTPP(1,1)=16.0
                      MTPP(2,1)=100.0
                      MTPP(1,2)=127.0
                      MTPP(2,2)=127.0
      685             MTPP(1,3)=0.0
                      MTPP(2,3)=0.0
                      MTPP(1,4)=32.0
                      MTPP(2,4)=64.0
                      MTPP(1,5)=23.0
```

```
      MTRP(2,5)=31.0
C
C
C        TOTAL SOFTWARE PROGRAM COST BY MANUFACTURER
      M=13
      DO 2000 M=1,5
      LC=57
      DO 1900 JJ=1,JMAX
      IF (LC.LT.56) GO TO 1040
      CALL ECSHED(N,NDATE,IFSYR,INSTAL,M)
      LC=11
 1040 J=INDEX(JJ)
      IF(JJ.GT.1) GOTO1045
      TTDHS(J)=TDHS(J)
      TTDCS(J)=TDCS(J)+PD(J)
      TRP(J,M)=NRP(J,M)
      GO TO 1055
C
C          SUM COOLING & HEATING SAVINGS FOR NEXT BLDG
C
 1045 TTDHS(J)=TTDHS(IJ)+TDHS(J)
      TTDCS(J)=TTDCS(IJ)+TDCS(J)+PD(J)
C
C     TOTAL REMOTE PANELS
C
      IF(M.EQ.1) GO TO 1051
      TRP(J,M) = NRP(J,M) + TRP(IJ,M)
      IF (TRP(J,M).GT.MTRP(ICT,M)) GO TO 1052
 1051 ACC=0.
      GO TO 1054
 1052 NC=NC+1
      IF (NC.EQ.1) GO TO 1053
      NC=2
C
C          ADDITIONAL CHANNEL COST
C
 1053 ACC = RPC(ICT,2,M) + CHC(NC,ICT,M)
      TRP(J,M)=1
      NC=0
C
C          TECS = TOTAL ENERGY CONTROL SYSTEM COST
C
 1054 TECS(J,M)=BCT(J,M)+TECS(IJ,M)+ACC
 1055 IF(JJ.EQ.1) TECS(J,M) = BCT(J,M)+TCC(M)
      IH=IHF(J)
      IC=ICF(J)
C
C     CALCULATE DISCOUNT PAYBACK PERIOD - MAXIMUM 10 YEARS
C
C          ZINT = INTEREST RATE
C          ZMC = MAINTENCE COST
C          ECSC = ECS COST BALANCE = TOTAL ECS COST + INTEREST
C                  - HEAT SAVINGS - COOLING SAVINGS
```

```
C      BAL = BALANCE
C
C        CALCULATE YEARLY HEATING & COOLING SAVINGS
C        AT EXPECTED YEAR OF OPERATION USING ESCALATION FACTORS
C
      NN=1
 1106 IAN = IEYO-ICY
      IF(IAN.EQ.0) GO TO 1200
      DO 1100 M2=1,JJ
      M1=INDEX(M2)
      IF(M2.GT.1) GO TO 1101
      SAP(M2)=TOHS(M1)*((1+YEF(IH,1))**NN)
      TAP(M2)=(TOCS(M1)+PO(M1))*((1+YEF(IC,1))**NN)
      GO TO 1102
 1101 SAP(M2)=TOHS(M1)*((1+YEF(IH,1))**NN)+SAP(M2-1)
      TAP(M2)=(TOCS(M1)+PO(M1))*((1+YEF(IC,1))**NN)+TAP(M2-1)
 1102 YHS(NN,J)=SAP(M2)
 1100 YCS(NN,J)=TAP(M2)
      ZEE(NN,J) = (YOC*((1+EFO)**NN))
      DEE(NN,J) = ((((1+RINT)**(-NN)) + ((1+RINT)**(-(NN-1))))/2.0)
      OEE(NN,J) = ((TECS(J,M)*.05)*((1+EFM)**NN)
      FEE(NN,J) = (YHS(NN,J) + YCS(NN,J) - OEE(NN,J))-
     1ZEE(NN,J)*DEE(NN,J)
 1200 IF (NN.GT.1) GO TO 1300
C
C        FIRST YEAR
      ZMC (NN,J)=(TECS(J,M)*.05)*((1+EFM)**IAN)
      OC(NN,J) = YOC*((1+EFO)**IAN)
      OMCN(NN,J)=ZMC(NN,J)+OC(NN,J)
      ECSB(NN,J)=FEE(NN,J)
      GO TO 1340
C
C        AFTER YEAR 1
 1300 ZMC(NN,J) = ZMC(NN-1,J)*(1+EFM)
      OC(NN,J) = OC(NN-1,J)*(1+EFO)
      ECSB(NN,J)= (FEE(NN,J) + ECSB(NN-1,J))
      OMCN(NN,J) = OMCN(NN-1,J)+ZMC(NN,J)+OC(NN,J)
C
 1340 BAL(NN,J)=TECS(J,M)-ECSB(NN,J)
C     **********************************************
C     CHECK FOR MAXIMUM OF 10 YEARS OR IF PAYBACK PERIOD HAS BEEN
C     REALIZED ( BALANCE = 0)
C
      IF (BAL(NN,J).GT.0.AND.NN.LT.10) GO TO 1800
C
C
      IF (BAL(NN,J).GT.0.AND.NN.EQ.10) GO TO 1550
      IF (BAL(NN,J).LE.0.AND.NN.GT.1)
     1DPP(J)=(NN-1)+(BAL(NN-1,J)/FEE(NN,J))
      IF (BAL(NN,J).LE.0.AND.NN.EQ.1)
     1DPP(J)=(NN-1)+(TECS(J,M)/FEE(NN,J))
C
C        REPORT 10
```

```
C
C     BSDI = BTU SAVED PER DOLLAR INVESTED
      IF(JJ.GT.1) GO TO 1543
      SET(J)    =  TOHS(J)*((1+YEF(IH,2))**IAN) + (TOCS(J)+PD(J))*
     1    ((1+YEF(IC,2))**IAN)
      SUM2(JJ)=THS(J)+TCS(J)
      GO TO 1542
 1543 SET(J)      =SET(IJ)+( TOHS(J)*((1+YEF(IH,2))**IAN))+
     1   (TOCS(J)+PD(J))*((1+YEF(IC,2))**IAN)
      SUM2(JJ)=SUM2(JJ-1)+THS(J)+TCS(J)
 1542 SMPB=(TECS(J,M))*((1+EFE )**IAN)/SET(J)
      BSDI=SUM2(JJ)*10**9/ (TECS(J,M)*((1+EFE )**IAN))
      ETECS=(TECS(J,M)*((1+EFE )**IAN))
      TC=ETECS+OMCB(1,J)
      WRITE(6,1541) JJ,NBN(J),OMCB(1,J),ETECS,    TC,DPP(J),SMPB,
     1     BSDI,SLT(J)
 1541 FORMAT(/,2X,I4,2X,I5,8X,F10.2,7X,F10.2,7X,F10.2,9X,F4.2,
     1  9X,F5.2,8X,F8.0,8X,F10.2)
      GO TO 1560
C
C          REPORT 10 WITH * IN PAYBACK PERIOD
C
 1550 IF(JJ.GT.1) GO TO 1553
      SET(J)    =  TOHS(J)*((1+YEF(IH,2))**IAN) + (TOCS(J)+PD(J))*
     1     ((1+YEF(IC,2))**IAN)
      SUM2(JJ)=THS(J)+TCS(J)
      GO TO 1552
 1553 SET(J)      =SET(IJ)+( TOHS(J)*((1+YEF(IH,2))**IAN))+
     1   (TOCS(J)+PD(J))*((1+YEF(IC,2))**IAN)
      SUM2(JJ)=SUM2(JJ-1)+THS(J)+TCS(J)
 1552 SMPB=(TECS(J,M))*((1+EFE )**IAN)/SET(J)
      BSDI=SUM2(JJ)*10**9/ (TECS(J,M)*((1+EFE )**IAN))
      ETECS=(TECS(J,M)*((1+EFE )**IAN))
      TC=ETECS+OMCB(1,J)
      WRITE(6,1551) JJ,NBN(J),OMCB(1,J),ETECS,    TC,SMPB,BSDI,
     1  SET(J)
 1551 FORMAT(/,2X,I4,2X,I5,8X,F10.2,7X,F10.2,7X,F10.2,9X,1H*,
     1   12X,F5.2,8X,F8.0,8X,F10.2)
 1560 NN=11
      LC=LC+2
      IJ=J
 1000 CONTINUE
      NN=NN+1
      IF(NN.LE.15)GO TO 1056
 1300 CONTINUE
 2000 CONTINUE
 3111 CONTINUE
 3000 CONTINUE
      WRITE(6,3001)
 3001 FORMAT(/,35X,*THE END*)
      STOP
      END
```

```
      SUBROUTINE ECSHED(N,NDATE,IFSYR,INSTAL,M)
C
C          THIS PROGRAM PRINTS PAGE AND COLUMN HEADINGS FOR
C            ALL REPORTS PRODUCED BY THE ECS SYSTEM
      DIMENSION MF(4,5),IFSYR(5),INSTAL(6),NDATE(18)
      DATA MF/4H    ,4H    ,4H    C,4HOMPA,4HNY-A,4H    ,4HCOMP,4HANY-,4HB
     1       4H    ,4H    ,4H    C,4HOMPA,4HNY-C,4H    ,4HCOMP,4HANY-,4HD
     2       4H    ,4H    ,4H    C,4HOMPA,4HNY-E/,
     3  IPC/1/
      WRITE(6,101) (NDATE(L),L=1,18),IPC
  101 FORMAT('1DATE: ',18A1,32X,'ENERGY CONTROL SYSTEM',43X,'PAGE ',I4)
      WRITE(6,111) IFSYR,(INSTAL(L),L=1,6)
  111 FORMAT(/,1X,5A1,42X,'INSTALLATION: ',6A4)
      IPC=IPC+1
      IF (N.LT.1.OR.N.GT.13) GOTO500
      GO TO(140,140,140,140,160,180,200,220,240,260,280,300,320),N
C
C                REPORT 1 COL HEADINGS
  140 WRITE(6,141) N
  141 FORMAT(/,1X,51X,'ENERGY SAVINGS LIST - SCHEME ',I1)
      WRITE(6,143)
  143 FORMAT(//,1X,10X,'BLDG',6X,'BLDG',6X,'BLDG',9X,'HEATING',7X,
     1       'HEATING',7X,'TOTAL',7X,'COOLING',7X,'COOLING',7X,'TOTAL')
      WRITE(6,145)
  145 FORMAT(1X,11X,'NO',7X,'TYPE',6X,'FLOOR',9X,'SAVING',8X,
     1       'GEOGRAPH',5X,'HEATING',6X,'SAVING',8X,'GEOGRAPH',5X,
     2       'COOLING')
      WRITE(6,147)
  147 FORMAT(1X,30X,'AREA',9X,'FACTOR',8X,'ADJUST',7X,'SAVINGS',6X,
     1       'FACTOR',8X,'ADJUST.',6X,'SAVINGS')
      WRITE(6,149)
  149 FORMAT(1X,29X,'(SQ FT)',5X,'(PERCENT)',17X,'(GBTU/YR)',6X,
     1       '(PERCENT)',18X,'(GBTU/YR)',/)
      GO TO 500
C
C          REPORT 2 COL HEADINGS
  160 K=6
      WRITE(6,141) K
      WRITE(6,161)
  161 FORMAT(//,1X,78X,'TOTAL',28X,'TOTAL')
      WRITE(6,163)
  163 FORMAT(1X,77X,'HEATING',26X,'COOLING')
      WRITE(6,165)
  165 FORMAT(1X,10X,'BLDG',8X,'BLDG',8X,'AIR VOLUME',20X,'DEL T',8X,
     1       'SAVINGS',10X,'DEL H',11X,'SAVINGS')
      WRITE(6,167)
  167 FORMAT(1X,11X,'NO',9X,'TYPE',10X,'(CFM)',11X,'HOURS',8X,'(F)',
     1       8X,'(GBTU/YR)',8X,'(BTU/LB)',8X,'(GBTU/YR)',/)
      GO TO 500
C
C          REPORT 3 COL HEADINGS
  180 WRITE(6,181)
  181 FORMAT(/,1X,54X,'YEARLY BLDG ENERGY SAVINGS')
      WRITE(6,183)
```

```
      183 FORMAT(//,1X, 4X,*BLDG*,7X,*TOTAL*,8X,*HEATING*, 7X,*TOTAL*, 7X,
     1       *COOLING*,15X,*SCHEME 8*,11X,*BLDG*,11X,*BASELINE*)
          WRITE(6,185)
      185 FORMAT(1X, 5X,*NO*,7X,*SCHEMES*,7X,*SAVINGS*,6X,*SCHEMES*, 6X,
     1       *SAVINGS*,10X,*DEMAND*,5X,*PEAK*,11X,*TOTAL*,
     1    16X, *COOLING*, 5X,*HEATING*)
          WRITE(6,186)
      186 FORMAT(1X,14X,*HEATING*,7X,*($/YR)*, 7X,*COOLING*, 7X,*($/YR)*,
     1       10X,*REDUCT*,5X,*REDUCT*,9X,*YEARLY*,4X,*(GBTU)*,5X,
     1*(GBTU)*)
          WRITE(6,187)
      187 FORMAT(1X,14X,*SAVINGS*,20X,*SAVINGS*,25X,*KW*,7X,*SAVINGS*,8X,
     1       *SAVINGS*)
          WRITE(6,189)
      189 FORMAT(1X,14X,*(GBTU/YR)*,18X,*(GBTU/YR)*,32X,*($/YR)*,12X,*$*,
     1    /)
          GO TO 500
C
C
C                 REPORT 4
      200 WRITE(6,201)
      201 FORMAT(/,1X,51X,*BLDG CONTROL POINT TABULATION*)
          WRITE(6,203)
      203 FORMAT(//,1X,13X,*BLDG*)
          WRITE(6,205)
      205 FORMAT(1X,14X,*NO*,11X,*SCHEME*,9X,*START/STOP*,10X,*RESET*,
     1       10X,*ANALOG*,10X,*BINARY*,/)
          GO TO 500
C
C                 REPORT 5
C
      220 WRITE(6,221)
      221 FORMAT(/,1X,60X,*LOCAL WIRING COST*)
          WRITE(6,223)
      223 FORMAT(//,1X,53X,*REMOTE*,20X,*REMOTE*)
          WRITE(6,225)
      225 FORMAT(1X,30X,*BRANCH*,17X,*POINTS*,6X,*WIRING*,8X,*POINTS*,8X,
     1       *WIRING*,16X,*TOTAL*)
          WRITE(6,227)
      227 FORMAT(1X,30X,*WIRING*,6X,*COST*,6X,*IN EQUIP*,6X,*COST*,6X,
     1       *OUT OF EQUIP*,6X,*COST*,6X,*WIRING*,5X,*WIRING*)
          WRITE(6,229)
      229 FORMAT(1X,10X,*BLDG*,5X,*NO OF*,3X,*COST PER*,5X,*TOTAL*,7X,
     1       *ROOM*,8X,*PER*,11X,*ROOM*,10X,*PER*,8X,*COST*,7X,*COST*)
          WRITE(6,231)
      231 FORMAT(1X,11X,*NO*,6X,*UNITS*,7X,*UNIT*,8X,*($)*,6X,*NO    FT*,
     1       6X,*FOOT*,8X,*NO    FT*,8X,*FOOT*,7X,*($)*,8X,*($)*,/)
          GO TO 500
C
C                 REPORT 6
C
      240 WRITE(6,241) (MF(L,M),L=1,4)
      241 FORMAT(/,1X,34X,4A4,* - REMOTE POINT COST TOTALS*)
```

```
      WRITE(6,243)
  243 FORMAT(//,1X,114X,*BLDG*,/,114X,*POINT*)
      WRITE(6,245)
  245 FORMAT  (1X,25X,*START/STOP*,15X,*RESET*,17X,*ANALOG*,17X,
     1      *BINARY*,12X,*COST*)
      WRITE(6,247)
  247 FORMAT(1X,11X,*BLDG*,99X,*TOTAL*,/,12X,*NO*,9X,*NO   COST/POINT*
     1      ,8X,*NO   COST/POINT*,8X,*NO   COST/POINT*,8X,*NO*,3X,
     2      *COST/POINT*,8X,*($)*,/)
      GO TO 500
C
C           REPORT 7 COL HEADINGS
C
  260 WRITE(6,261) (MF(L,M),L=1,4)
  261 FORMAT(//,1X,35X,4A4,*- TELEPHONE LINE EQUIPMENT COST*)
      WRITE(6,263)
C
  263 FORMAT(//,1X,56X,*BLDG*,43X,*BLDG*,10X,*BLDG*)
      WRITE(6,265)
  265 FORMAT(1X,38X,*COST PER*,9X,*REMOTE*,24X,*COST PER*,9X,*REMOTE*,
     1      9X,*TOTAL*)
      WRITE(6,267)
  267 FORMAT(1X,23X,*NO OF*,11X,*REMOTE*,10X,*PANEL*,10X,*NO OF*,11X,
     1      *REMOTE*,10X,*MODEM*,10X,*EQUIP*)
      WRITE(6,269)
  269 FORMAT(1X,10X,*BLDG*,9X,*REMOTE*,10X,*PANEL*,12X,*COST*,10X,
     1      *REMOTE*,10X,*MODEM*,12X,*COST*,10X,*COST*)
      WRITE(6,271)
  271 FORMAT(1X,11X,*NO*,10X,*PANELS*,11X,*($)*,13X,*($)*,11X,
     1      *MODEMS*,11X,*($)*,13X,*($)*,11X,*($)*,/)
      GO TO 500
C
C           REPORT 8      COAX CABLE AND CONNECTION COST
C
  280 WRITE(6,281)(MF(L,M),L=1,4)
  281 FORMAT(/,1X,35X,4A4,* - COAX CABLE AND CONNECTION COST*)
      WRITE(6,283)
  283 FORMAT(1X,113X,*BLDG*)
      WRITE(6,285)
  285 FORMAT(/,1X,33X,*REQD*,15X,*COAX*,57X,*COAX*)
      WRITE(6,287)
  287 FORMAT(1X,32X,*LENGTH*,14X,*CABLE*,14X,*NO OF*,14X,*CONNECTION*,
     1      13X,*CABLE*)
      WRITE(6,289)
  289 FORMAT(1X,14X,*BLDG*,13X,*OF CABLE*,14X,*COST*,14X,*REMOTE*,16X,
     1      *COST*,16X,*COST*)
      WRITE(6,291)
  291 FORMAT(1X,15X,*NO*,16X,*(FT)*,14X,*($/FT)*,13X,*PANELS*,16X,
     1      *($)*,17X,*($)*,/)
      GO TO 500
C
C           REPORT 9
```

```
      C
  301 WRITE(6,301) (MF(L,M),L=1,4)
      FORMAT(/,1X,45X,4A4,* - BUILDING COST TOTAL*)
      WRITE(6,303)
  303 FORMAT(//,1X,30X,*EQUIP **,34X,*EST*)
      WRITE(6,305)
  305 FORMAT(1X,30X,*WIRING*,15X,*EST*,16X,*NEW*,15X,*BLDG*)
      WRITE(6,307)
  307 FORMAT(1X,14X,*BLDG*,13X,*COST*,16X,*REPAIR*,13X,*EQUIP*,14X,
     1       *COST*)
      WRITE(6,309)
  309 FORMAT(1X,15X,*NO*,13X,*TOTALS*,16X,*COST*,14X,*COST*,14X,
     1       *TOTALS*)
      WRITE(6,311)
  311 FORMAT(1X,31X,*(1)*,18X,*(8)*,16X,*($)*,15X,*($)*,/)
      GO TO 500
      C
      C              REPORT 10
      C
  320 WRITE(6,321) (MF(L,M),L=1,4)
  321 FORMAT(/,1X,10X,4A4,* - DISCOUNTED AND SIMPLE PAYBACK PERIOD
     1 AT EXP YEAR OPERATION*)
      WRITE(6,323)
  323 FORMAT(//,1X,20X,*OPERATING **,10X,*TOTAL*,24X,*DISCOUNTED*,
     1       6X,*SIMPLE*,10X,*BTU SAVED*,8X,*TOTAL*)
      WRITE(6,325)
  325 FORMAT(1X,20X,*MAINTENANCE*,11X,*ECS*,12X,*TOTAL*, 9X,*PAYBACK*,
     1       7X,*PAYBACK*,10X,*PER*,14X,*ENERGY*)
      WRITE(6,327)
  327 FORMAT(1X, 5X,*NO OF*,13X,*COST*,14X,*COST*,12X,*COST*,10X,
     1       *PERIOD*,8X,*PERIOD*,11X,*DOLLAR*,10X,*SAVINGS*)
      WRITE(6,329)
  329 FORMAT(1X, 5X,*BLDGS*,14X,*(1)*,15X,*($)*,13X,*($)*,11X,*(YRS)*,
     1       9X,*(YRS)*,11X,*INVESTED*,12X,*(8)*,/)
  500 RETURN
      END
```

SYMBOLIC REFERENCE MAP (R=3)

ENTRY POINTS

		DEF LINE	REFERENCES
4	ECSHED	1	194

VARIABLES

SN		TYPE		RELOCATION									
0	IFSYR	INTEGER	ARRAY	F.P.	REFS	4	11	DEFINED	1				
0	INSTAL	INTEGER	ARRAY	F.P.	REFS	4	11	DEFINED	1				
271	IPC	INTEGER			REFS	9	13	DEFINED	5	13			
1444	K	INTEGER			REFS	37	DEFINED	36					
1443	L	INTEGER			REFS	9	11	105	120	141	161	179	
					DEFINED	9	11	105	120	141	161	179	

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FY 77 — INSTALLATION: FT.SOMEWHERE, USA

ENERGY SAVINGS LIST - SCHEME 1

BLDG NO	BLDG TYPE	BLDG FLOOR AREA (SQ FT)0	HEATING SAVING FACTOR (PERCENT)	HEATING GEOGRAPH ADJUST	TOTAL HEATING SAVINGS (GBTU/YR)	COOLING SAVING FACTOR (PERCENT)	COOLING GEOGRAPH ADJUST.	TOTAL COOLING SAVINGS (GBTU/YR)
9	12	12025.0	.18	1.000	.169	.10	1.000	.043
11	12	8005.0	.18	1.000	.112	.10	1.000	.029
20	11	32940.0	.11	1.000	.040	.02	1.000	.018
27	12	24049.0	.18	1.000	.338	.10	1.000	0.000
28	12	26202.0	.18	1.000	.368	.10	1.000	.094
36	4	9271.0	.11	1.000	.094	.03	1.000	.034
37	12	10276.0	.18	1.000	.144	.10	1.000	.037
56	12	25235.0	.18	1.000	.354	.10	1.000	0.000
59	12	19301.0	.18	1.000	.271	.10	1.000	.069
82	18	70467.0	.03	1.000	.118	.04	1.000	0.000
105	12	15288.0	.18	1.010	.215	.10	1.000	.055
116	12	5185.0	.18	1.000	.073	.10	1.000	.019
117	12	10962.0	.18	1.000	.154	.10	1.000	.039
133	12	41875.0	.18	1.010	.588	.10	1.000	.151
134	12	27775.0	.18	1.000	.390	.10	1.000	.100
138	12	10137.0	.18	1.000	.142	.10	1.000	.036
161	12	40908.0	.18	1.010	.574	.10	1.000	.147
163	12	15090.0	.18	1.000	.212	.10	1.000	0.000
165	5	9124.0	.07	1.010	.109	.05	1.000	0.000
185	4	19343.0	.11	1.000	.196	.03	1.000	.071
201	3	11562.0	.12	1.000	.050	.02	1.000	.025
					4.711			.963

APPENDIX C - OUTPUT LISTING

FY 77 INSTALLATION: FT.SOMEWHERE, USA

ENERGY SAVINGS LIST - SCHEME 2

BLDG NO	BLDG TYPE	BLDG FLOOR AREA (SQ FT)#	HEATING SAVING FACTOR (PERCENT)	HEATING GEOGRAPH ADJUST	TOTAL HEATING SAVINGS (GBTU/YR)	COOLING SAVING FACTOR (PERCENT)	COOLING GEOGRAPH ADJUST.	TOTAL COOLING SAVINGS (GBTU/YR)
9	12	12025.0	.30	1.000	.231	.16	1.000	.062
11	12	8065.0	.30	1.000	.154	.16	1.000	.041
20	11	32940.0	.17	1.000	.055	.03	1.000	.026
27	12	24049.0	.30	1.000	.461	.16	1.000	0.000
28	12	26202.0	.30	1.000	.503	.16	1.000	.135
36	4	9271.0	.17	1.000	.129	.05	1.000	.055
37	12	10276.0	.30	1.000	.197	.16	1.000	.053
56	12	25235.0	.30	1.000	.484	.16	1.000	0.000
59	12	19301.0	.30	1.000	.370	.16	1.000	.100
82	18	70467.0	.06	1.000	.230	.06	1.000	0.000
105	12	15288.0	.30	1.000	.293	.16	1.000	.079
116	12	5185.0	.30	1.000	.099	.16	1.000	.027
117	12	10962.0	.30	1.000	.210	.16	1.000	.057
133	12	41875.0	.30	1.000	.803	.16	1.000	.217
134	12	27775.0	.30	1.000	.533	.16	1.000	.144
138	12	10137.0	.30	1.000	.195	.16	1.000	.053
161	12	40908.0	.30	1.000	.785	.16	1.000	.212
163	12	15090.0	.30	1.000	.290	.16	1.000	0.000
165	5	9124.0	.11	1.000	.160	.08	1.000	0.000
185	4	19343.0	.17	1.000	.269	.05	1.000	.115
201	3	11562.0	.19	1.000	.070	.03	1.000	.036
					6.521			1.415

FY 77 INSTALLATION: FT.SOMEWHERE, USA

ENERGY SAVINGS LIST - SCHEME 3

BLDG NO	BLDG TYPE	BLDG FLOOR AREA (SQ FT)#	HEATING SAVING FACTOR (PERCENT)	HEATING GEOGRAPH ADJUST	TOTAL HEATING SAVINGS (GBTU/YR)	COOLING SAVING FACTOR (PERCENT)	COOLING GEOGRAPH ADJUST.	TOTAL COOLING SAVINGS (GBTU/YR)
9	12	12025.0	.11	1.000	.036	.11	1.000	.022
11	12	8005.0	.11	1.000	.024	.11	1.000	.014
20	11	32940.0	.02	1.000	.003	.01	1.000	.005
27	12	24049.0	.11	1.000	0.000	.11	1.000	0.000
28	12	26202.0	.11	1.000	.077	.11	1.000	.047
36	4	9271.0	.24	1.000	.091	.23	1.000	.145
37	12	10276.0	.11	1.000	.030	.11	1.000	.018
56	12	25235.0	.11	1.000	0.000	.11	1.000	0.000
59	12	19301.0	.11	1.000	.057	.11	1.000	.035
82	18	70467.0	0.00	1.000	0.000	0.00	1.000	0.000
105	12	15288.0	.11	1.000	.045	.11	1.000	.027
116	12	5185.0	.11	1.000	.015	.11	1.000	.009
117	12	10962.0	.11	1.000	.032	.11	1.000	.020
133	12	41875.0	.11	1.000	.124	.11	1.000	.075
134	12	27775.0	.11	1.000	.082	.11	1.000	.050
138	12	10137.0	.11	1.000	.030	.11	1.000	.018
161	12	40908.0	.11	1.000	0.000	.11	1.000	0.000
163	12	15090.0	.11	1.000	0.000	.11	1.000	0.000
165	5	9124.0	.02	1.000	0.000	.02	1.000	0.000
185	4	19343.0	.24	1.000	.189	.23	1.000	.303
201	3	11562.0	.09	1.000	.016	.09	1.000	.064
					.852			.852

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FY 77 INSTALLATION: FT.SOMEWHERE, USA

ENERGY SAVINGS LIST - SCHEME 4

BLDG NO	BLDG TYPE	BLDG FLOOR AREA (SQ FT)#	HEATING SAVING FACTOR (PERCENT)	HEATING GEOGRAPH ADJUST.	TOTAL HEATING SAVINGS (GBTU/YR)	COOLING SAVING FACTOR (PERCENT)	COOLING GEOGRAPH ADJUST.	TOTAL COOLING SAVINGS (GBTU/YR)
9	12	12025.0	0.00	1.000	0.000	.15	1.000	.038
11	12	8005.0	0.00	1.000	0.000	.15	1.000	.025
20	11	32940.0	0.00	1.000	0.000	.22	1.000	.184
28	12	26202.0	0.00	1.000	0.000	.15	1.000	.083
36	4	9271.0	0.00	1.000	0.000	.15	1.000	.121
37	12	10276.0	0.00	1.000	0.000	.15	1.000	.032
59	12	19301.0	0.00	1.000	0.000	.15	1.000	.061
105	12	15288.0	0.00	1.000	0.000	.15	1.000	.048
116	12	5185.0	0.00	1.000	0.000	.15	1.000	.016
117	12	10962.0	0.00	1.000	0.000	.15	1.000	.035
133	12	41875.0	0.00	1.000	0.000	.15	1.000	.132
134	12	27775.0	0.00	1.000	0.000	.15	1.000	.087
138	12	10137.0	0.00	1.000	0.000	.15	1.000	.032
161	12	40908.0	0.00	1.000	0.000	.15	1.000	.129
185	4	19343.0	0.00	1.000	0.000	.15	1.000	.253
201	3	11562.0	0.00	1.000	0.000	.10	1.000	.107
					0.000			1.384

FY 77 INSTALLATION: FT.SOMEWHERE, USA

ENERGY SAVINGS LIST - SCHEME 6

BLDG NO	BLDG TYPE	AIR VOLUME (CFM)	HOURS	DEL T (F)	TOTAL HEATING SAVINGS (GBTU/YR)	DEL H (BTU/LB)	TOTAL COOLING SAVINGS (GBTU/YR)
					0.000		0.000

FY 77 INSTALLATION: FT.SOMEWHERE, USA

YEARLY BLDG ENERGY SAVINGS

BLDG NO	TOTAL SCHEMES HEATING SAVINGS (GBTU/YR)	HEATING SAVINGS ($/YR)	TOTAL SCHEMES COOLING SAVINGS (GBTU/YR)	COOLING SAVINGS ($/YR)	SCHEME 8 DEMAND REDUCT KW	SCHEME 8 PEAK REDUCT SAVINGS ($/YR)	BLDG TOTAL YEARLY SAVINGS $	BASELINE COOLING (GBTU)	BASELINE HEATING (GBTU)
9	.435	1413.24	.165	1195.83	0.0	0.00	2609.07	.433	.938
11	.290	940.79	.110	795.06	0.0	0.00	1736.85	.288	.624
20	.098	317.96	.233	1688.77	0.0	0.00	2006.73	.889	.362
27	.799	2595.54	0.000	0.00	0.0	0.00	2595.54	0.000	1.876
28	.944	3079.39	.360	2605.68	0.0	0.00	5685.07	.943	2.044
36	.314	1018.60	.356	2577.91	0.0	0.00	3596.51	1.140	.853
37	.372	1207.69	.141	1021.90	0.0	0.00	2229.59	.370	.802
56	.839	2723.54	0.000	0.00	0.0	0.00	2723.54	0.000	1.968
59	.698	2268.35	.265	1919.40	0.0	0.00	4187.75	.695	1.505
82	.348	1130.50	0.000	0.00	0.0	0.00	1130.50	0.000	3.946
105	.553	1796.72	.210	1520.33	0.0	0.00	3317.05	.550	1.192
116	.188	609.37	.071	515.63	0.0	0.00	1124.99	.187	.404
117	.397	1288.31	.150	1090.12	0.0	0.00	2378.43	.395	.855
133	1.515	4921.36	.575	4164.29	0.0	0.00	9085.65	1.508	3.266
134	1.005	3264.26	.381	2762.11	0.0	0.00	6026.36	1.000	2.166
138	.367	1191.35	.139	1008.08	0.0	0.00	2199.43	.365	.791
161	1.353	4415.08	.488	3535.87	0.0	0.00	7950.96	1.473	3.191
163	.501	1628.62	0.000	0.00	0.0	0.00	1628.62	0.000	1.177
165	.269	873.16	0.000	0.00	0.0	0.00	873.16	0.000	1.560
185	.654	2058.17	.743	5378.56	0.0	0.00	7436.72	2.379	1.780
201	.136	440.32	.232	1677.84	0.0	0.00	2118.16	1.237	.416
TOTAL	12.084	39182.	4.619	33459.			72640.70	13.9	31.7

FY 77 INSTALLATION: FT.SOMEWHERE, USA

BLDG CONTROL POINT TABULATION

BLDG NO	SCHEME	START/STOP	RESET	ANALOG	BINARY
9	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4
11	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4
20	1	8	0	0	8
	2	0	2	0	0
	3	0	0	2	0
	4	0	2	2	0
	TOTAL	8	4	4	8
27	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	TOTAL	4	1	1	4
28	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4
36	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4

FY 77 INSTALLATION: FT.SOMEWHERE, USA

BLDG CONTROL POINT TABULATION

BLDG NO	SCHEME	START/STOP	RESET	ANALOG	BINARY
37	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4
56	1	7	0	0	7
	2	0	1	0	0
	3	0	0	3	0
	TOTAL	7	1	3	7
59	1	10	0	0	10
	2	0	4	0	0
	3	0	0	4	0
	4	0	4	4	0
	TOTAL	10	8	8	10
82	1	2	0	0	2
	2	0	1	0	0
	3	0	0	1	0
	TOTAL	2	1	1	2
105	1	6	0	0	6
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
	TOTAL	6	0	0	6
116	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4

FY 77 INSTALLATION: FT.SOMEWHERE, USA

BLDG CONTROL POINT TABULATION

BLDG NO	SCHEME	START/STOP	RESET	ANALOG	BINARY
117	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4
133	1	8	0	0	8
	2	0	2	0	0
	3	0	0	2	0
	4	0	2	2	0
	TOTAL	8	4	4	8
134	1	3	0	0	3
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	3	2	2	3
138	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4
161	1	8	0	0	8
	2	0	2	0	0
	3	0	0	2	0
	4	0	2	2	0
	TOTAL	8	4	4	8
163	1	6	0	0	6
	2	0	2	0	0
	3	0	0	2	0
	TOTAL	6	2	2	6

FY 77 INSTALLATION: FT.SOMEWHERE, USA

BLDG CONTROL POINT TABULATION

BLDG NO	SCHEME	START/STOP	RESET	ANALOG	BINARY
165	1	3	3	0	3
	2	0	0	0	0
	3	0	0	0	0
	TOTAL	3	0	0	3
185	1	21	0	0	21
	2	0	10	0	0
	3	0	0	10	0
	4	0	10	10	0
	TOTAL	21	20	20	21
201	1	4	0	0	4
	2	0	1	0	0
	3	0	0	1	0
	4	0	1	1	0
	TOTAL	4	2	2	4

TOTAL 378

FY 77 INSTALLATION: FT.SOMEWHERE, USA

LOCAL WIRING COST

BLDG NO	NO OF UNITS	BRANCH WIRING COST PER UNIT	COST TOTAL ($)	REMOTE POINTS IN EQUIP ROOM NO	REMOTE POINTS IN EQUIP ROOM FT	WIRING COST PER FOOT	REMOTE POINTS OUT OF EQUIP ROOM NO	REMOTE POINTS OUT OF EQUIP ROOM FT	WIRING COST PER FOOT	WIRING COST ($)	TOTAL WIRING COST ($)
9	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
11	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
20	8	35.00	280.00	4	30	3.00	20	60	2.00	750.00	1030.00
27	4	35.00	140.00	2	30	2.00	8	60	2.00	360.00	500.00
28	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
36	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
37	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
56	7	35.00	245.00	2	30	2.00	18	60	2.00	660.00	905.00
59	10	35.00	350.00	4	30	3.00	32	60	2.00	870.00	1220.00
82	2	35.00	70.00	0	30	0.00	6	60	2.00	240.00	310.00
105	6	35.00	210.00	6	30	4.00	6	60	2.00	360.00	570.00
116	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
117	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
133	8	35.00	280.00	4	30	3.00	20	60	2.00	750.00	1030.00
134	3	35.00	105.00	2	30	2.00	8	60	2.00	360.00	465.00
138	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
161	8	35.00	280.00	4	30	3.00	20	60	2.00	750.00	1030.00
163	6	35.00	210.00	2	30	2.00	14	60	2.00	540.00	750.00
165	3	35.00	105.00	2	30	2.00	4	60	2.00	240.00	345.00
185	21	35.00	735.00	4	30	3.00	78	60	2.00	870.00	1605.00
201	4	35.00	140.00	2	30	2.00	10	60	2.00	420.00	560.00
									TOTAL		14400.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-A - REMOTE POINT COST TOTALS

BLDG NO	START/STOP NO	START/STOP COST/POINT	RESET NO	RESET COST/POINT	ANALOG NO	ANALOG COST/POINT	BINARY NO	BINARY COST/POINT	BLDG POINT COST TOTAL ($)
9	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
11	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
20	8	400.00	4	330.00	4	406.00	8	260.00	8224.00
27	4	400.00	1	330.00	1	406.00	4	260.00	3376.00
28	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
36	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
37	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
56	7	400.00	3	330.00	3	406.00	7	260.00	6828.00
59	10	400.00	8	330.00	8	406.00	10	260.00	12488.00
82	2	400.00	1	330.00	1	406.00	2	260.00	2056.00
105	6	400.00	0	330.00	0	406.00	6	260.00	3960.00
116	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
117	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
133	8	400.00	4	330.00	4	406.00	8	260.00	8224.00
134	3	400.00	2	330.00	2	406.00	3	260.00	3452.00
138	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
161	8	400.00	4	330.00	4	406.00	8	260.00	8224.00
163	6	400.00	2	330.00	2	406.00	6	260.00	5432.00
165	3	400.00	0	330.00	0	406.00	3	260.00	1980.00
185	21	400.00	20	330.00	20	406.00	21	260.00	28580.00
201	4	400.00	2	330.00	2	406.00	4	260.00	4112.00
							TOTAL		129832.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-B - REMOTE POINT COST TOTALS

BLDG NO	START/STOP NO	START/STOP COST/POINT	RESET NO	RESET COST/POINT	ANALOG NO	ANALOG COST/POINT	BINARY NO	BINARY COST/POINT	BLDG POINT COST TOTAL ($)
9	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
11	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
20	8	405.00	4	500.00	4	330.00	8	160.00	7840.00
27	4	405.00	1	500.00	1	330.00	4	160.00	3090.00
28	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
36	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
37	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
56	7	405.00	3	500.00	3	330.00	7	160.00	6445.00
59	10	405.00	6	500.00	6	330.00	10	160.00	12290.00
82	2	405.00	1	500.00	1	330.00	2	160.00	1960.00
105	6	405.00	0	500.00	0	330.00	5	160.00	3390.00
116	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
117	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
133	8	405.00	4	500.00	4	330.00	8	160.00	7840.00
134	3	405.00	2	500.00	2	330.00	3	160.00	3355.00
138	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
161	8	405.00	4	500.00	4	330.00	8	160.00	7840.00
163	6	405.00	2	500.00	2	330.00	6	160.00	5050.00
165	3	405.00	0	500.00	0	330.00	3	160.00	1695.00
185	21	405.00	20	500.00	20	330.00	21	160.00	20465.00
201	4	405.00	2	500.00	2	330.00	4	160.00	3920.00
								TOTAL	123540.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-C - REMOTE POINT COST TOTALS

BLDG NO	START/STOP NO	START/STOP COST/POINT	RESET NO	RESET COST/POINT	ANALOG NO	ANALOG COST/POINT	BINARY NO	BINARY COST/POINT	BLDG POINT COST TOTAL ($)
9	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
11	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
20	8	170.00	4	280.00	4	105.00	8	250.00	4900.00
27	4	170.00	1	280.00	1	105.00	4	250.00	2065.00
28	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
36	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
37	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
56	7	170.00	3	280.00	3	105.00	7	250.00	4095.00
59	10	170.00	8	280.00	8	105.00	10	250.00	7280.00
82	2	170.00	1	280.00	1	105.00	2	250.00	1225.00
105	6	170.00	0	280.00	0	105.00	5	250.00	2520.00
116	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
117	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
133	8	170.00	4	280.00	4	105.00	8	250.00	4900.00
134	3	170.00	2	280.00	2	105.00	3	250.00	2030.00
138	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
161	8	170.00	4	280.00	4	105.00	8	250.00	4900.00
163	6	170.00	2	280.00	2	105.00	6	250.00	3290.00
165	3	170.00	0	280.00	0	105.00	3	250.00	1260.00
185	21	170.00	20	280.00	20	105.00	21	250.00	16520.00
201	4	170.00	2	280.00	2	105.00	4	250.00	2450.00
							TOTAL		77035.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-D - REMOTE POINT COST TOTALS

BLDG NO	START/STOP NO	START/STOP COST/POINT	RESET NO	RESET COST/POINT	ANALOG NO	ANALOG COST/POINT	BINARY NO	BINARY COST/POINT	BLDG POINT COST TOTAL ($)
9	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
11	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
20	8	75.00	4	150.00	4	120.00	8	100.00	2480.00
27	4	75.00	1	150.00	1	120.00	4	100.00	970.00
28	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
36	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
37	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
56	7	75.00	3	150.00	3	120.00	7	100.00	2035.00
59	10	75.00	8	150.00	8	120.00	10	100.00	3910.00
82	2	75.00	1	150.00	1	120.00	2	100.00	620.00
105	6	75.00	0	150.00	0	120.00	6	100.00	1050.00
116	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
117	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
133	8	75.00	4	150.00	4	120.00	8	100.00	2480.00
134	3	75.00	2	150.00	2	120.00	3	100.00	1065.00
138	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
161	8	75.00	4	150.00	4	120.00	8	100.00	2480.00
163	6	75.00	2	150.00	2	120.00	6	100.00	1590.00
165	3	75.00	0	150.00	0	120.00	3	100.00	525.00
185	21	75.00	20	150.00	20	120.00	21	100.00	9075.00
201	4	75.00	2	150.00	2	120.00	4	100.00	1240.00
							TOTAL		39440.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-E - REMOTE POINT COST TOTALS

BLDG NO	START/STOP NO	START/STOP COST/POINT	RESET NO	RESET COST/POINT	ANALOG NO	ANALOG COST/POINT	BINARY NO	BINARY COST/POINT	BLDG POINT COST TOTAL ($)
9	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
11	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
20	8	361.00	4	687.00	4	430.00	8	240.00	2079.00
27	4	361.00	1	687.00	1	430.00	4	240.00	1718.00
28	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
36	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
37	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
56	7	361.00	3	687.00	3	430.00	7	240.00	2079.00
59	10	361.00	8	687.00	8	430.00	10	240.00	3797.00
82	2	361.00	1	687.00	1	430.00	2	240.00	1718.00
105	6	361.00	0	687.00	0	430.00	5	240.00	962.00
116	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
117	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
133	8	361.00	4	687.00	4	430.00	8	240.00	2079.00
134	3	361.00	2	687.00	2	430.00	3	240.00	1718.00
138	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
161	8	361.00	4	687.00	4	430.00	8	240.00	2079.00
163	6	361.00	2	687.00	2	430.00	6	240.00	2079.00
165	3	361.00	0	687.00	0	430.00	3	240.00	601.00
185	21	361.00	20	687.00	20	430.00	21	240.00	8471.00
201	4	361.00	2	687.00	2	430.00	4	240.00	1718.00
							TOTAL		44842.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-A- TELEPHONE LINE EQUIPMENT COST

BLDG NO	NO OF REMOTE PANELS	COST PER REMOTE PANEL ($)	BLDG REMOTE PANEL COST ($)	NO OF REMOTE MODEMS	COST PER REMOTE MODEM ($)	BLDG REMOTE MODEM COST ($)	BLDG TOTAL EQUIP COST ($)
9	1	2000.00	2000.00	1	325.00	325.00	2325.00
11	1	2000.00	2000.00	1	325.00	325.00	2325.00
20	1	2000.00	2000.00	1	325.00	325.00	2325.00
27	1	2000.00	2000.00	1	325.00	325.00	2325.00
28	1	2000.00	2000.00	1	325.00	325.00	2325.00
36	1	2000.00	2000.00	1	325.00	325.00	2325.00
37	1	2000.00	2000.00	1	325.00	325.00	2325.00
56	1	2000.00	2000.00	1	325.00	325.00	2325.00
59	1	2000.00	2000.00	1	325.00	325.00	2325.00
82	1	2000.00	2000.00	1	325.00	325.00	2325.00
105	1	2000.00	2000.00	1	325.00	325.00	2325.00
116	1	2000.00	2000.00	1	325.00	325.00	2325.00
117	1	2000.00	2000.00	1	325.00	325.00	2325.00
133	1	2000.00	2000.00	1	325.00	325.00	2325.00
134	1	2000.00	2000.00	1	325.00	325.00	2325.00
138	1	2000.00	2000.00	1	325.00	325.00	2325.00
161	1	2000.00	2000.00	1	325.00	325.00	2325.00
163	1	2000.00	2000.00	1	325.00	325.00	2325.00
165	1	2000.00	2000.00	1	325.00	325.00	2325.00
185	1	2000.00	6000.00	3	325.00	975.00	6975.00
201	1	2000.00	2000.00	1	325.00	325.00	2325.00
					TOTAL		53475.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-B - TELEPHONE LINE EQUIPMENT COST

BLDG NO	NO OF REMOTE PANELS	COST PER REMOTE PANEL ($)	BLDG REMOTE PANEL COST ($)	NO OF REMOTE MODEMS	COST PER REMOTE MODEM ($)	BLDG REMOTE MODEM COST ($)	BLDG TOTAL EQUIP COST ($)
9	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
11	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
20	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
27	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
28	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
36	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
37	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
56	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
59	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
82	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
105	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
116	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
117	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
133	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
134	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
138	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
161	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
163	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
165	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
185	3	1200.00	3600.00	3	2125.00	6375.00	9975.00
201	1	1200.00	1200.00	1	2125.00	2125.00	3325.00
					TOTAL		76475.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-C- TELEPHONE LINE EQUIPMENT COST

BLDG NO	NO OF REMOTE PANELS	COST PER REMOTE PANEL ($)	BLDG REMOTE PANEL COST ($)	NO OF REMOTE MODEMS	COST PER REMOTE MODEM ($)	BLDG REMOTE MODEM COST ($)	BLDG TOTAL EQUIP COST ($)
9	1	2895.00	2895.00	1	845.00	845.00	3740.00
11	1	2895.00	2895.00	1	845.00	845.00	3740.00
20	1	2895.00	2895.00	1	845.00	845.00	3740.00
27	1	2895.00	2895.00	1	845.00	845.00	3740.00
28	1	2895.00	2895.00	1	845.00	845.00	3740.00
36	1	2895.00	2895.00	1	845.00	845.00	3740.00
37	1	2895.00	2895.00	1	845.00	845.00	3740.00
56	1	2895.00	2895.00	1	845.00	845.00	3740.00
59	1	2895.00	2895.00	1	845.00	845.00	3740.00
82	1	2895.00	2895.00	1	845.00	845.00	3740.00
105	1	2895.00	2895.00	1	845.00	845.00	3740.00
116	1	2895.00	2895.00	1	845.00	845.00	3740.00
117	1	2895.00	2895.00	1	845.00	845.00	3740.00
133	1	2895.00	2895.00	1	845.00	845.00	3740.00
134	1	2895.00	2895.00	1	845.00	845.00	3740.00
138	1	2895.00	2895.00	1	845.00	845.00	3740.00
161	1	2895.00	2895.00	1	845.00	845.00	3740.00
163	1	2895.00	2895.00	1	845.00	845.00	3740.00
165	1	2895.00	2895.00	1	845.00	845.00	3740.00
185	1	2895.00	2895.00	1	845.00	845.00	3740.00
201	1	2895.00	2895.00	1	845.00	845.00	3740.00
					TOTAL		78540.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-D - TELEPHONE LINE EQUIPMENT COST

BLDG NO	NO OF REMOTE PANELS	COST PER REMOTE PANEL ($)	BLDG REMOTE PANEL COST ($)	NO OF REMOTE MODEMS	COST PER REMOTE MODEM ($)	BLDG REMOTE MODEM COST ($)	BLDG TOTAL EQUIP COST ($)
9	1	2940.00	2940.00	1	875.00	875.00	3815.00
11	1	2940.00	2940.00	1	875.00	875.00	3815.00
20	1	2940.00	2940.00	1	875.00	875.00	3815.00
27	1	2940.00	2940.00	1	875.00	875.00	3815.00
28	1	2940.00	2940.00	1	875.00	875.00	3815.00
36	1	2940.00	2940.00	1	875.00	875.00	3815.00
37	1	2940.00	2940.00	1	875.00	875.00	3815.00
56	1	2940.00	2940.00	1	875.00	875.00	3815.00
59	1	2940.00	2940.00	1	875.00	875.00	3815.00
82	1	2940.00	2940.00	1	875.00	875.00	3815.00
105	1	2940.00	2940.00	1	875.00	875.00	3815.00
116	1	2940.00	2940.00	1	875.00	875.00	3815.00
117	1	2940.00	2940.00	1	875.00	875.00	3815.00
133	1	2940.00	2940.00	1	875.00	875.00	3815.00
134	1	2940.00	2940.00	1	875.00	875.00	3815.00
138	1	2940.00	2940.00	1	875.00	875.00	3815.00
161	1	2940.00	2940.00	1	875.00	875.00	3815.00
163	1	2940.00	2940.00	1	875.00	875.00	3815.00
165	1	2940.00	2940.00	1	875.00	875.00	3815.00
185	2	2940.00	5880.00	2	875.00	1750.00	7630.00
201	1	2940.00	2940.00	1	875.00	875.00	3815.00
					TOTAL		83930.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-E- TELEPHONE LINE EQUIPMENT COST

BLDG NO	NO OF REMOTE PANELS	COST PER REMOTE PANEL ($)	BLDG REMOTE PANEL COST ($)	NO OF REMOTE MODEMS	COST PER REMOTE MODEM ($)	BLDG REMOTE MODEM COST ($)	BLDG TOTAL EQUIP COST ($)
9	1	2500.00	2500.00	1	0.00	0.00	2500.00
11	1	2500.00	2500.00	1	0.00	0.00	2500.00
20	1	2500.00	2500.00	1	0.00	0.00	2500.00
27	1	2500.00	2500.00	1	0.00	0.00	2500.00
28	1	2500.00	2500.00	1	0.00	0.00	2500.00
36	1	2500.00	2500.00	1	0.00	0.00	2500.00
37	1	2500.00	2500.00	1	0.00	0.00	2500.00
56	1	2500.00	2500.00	1	0.00	0.00	2500.00
59	1	2500.00	2500.00	1	0.00	0.00	2500.00
82	1	2500.00	2500.00	1	0.00	0.00	2500.00
105	1	2500.00	2500.00	1	0.00	0.00	2500.00
116	1	2500.00	2500.00	1	0.00	0.00	2500.00
117	1	2500.00	2500.00	1	0.00	0.00	2500.00
133	1	2500.00	2500.00	1	0.00	0.00	2500.00
134	1	2500.00	2500.00	1	0.00	0.00	2500.00
138	1	2500.00	2500.00	1	0.00	0.00	2500.00
161	1	2500.00	2500.00	1	0.00	0.00	2500.00
163	1	2500.00	2500.00	1	0.00	0.00	2500.00
165	1	2500.00	2500.00	1	0.00	0.00	2500.00
185	1	2500.00	2500.00	1	0.00	0.00	2500.00
201	1	2500.00	2500.00	1	0.00	0.00	2500.00
					TOTAL		$2500.00

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-A - BUILDING COST TOTAL

BLDG NO	EQUIP & WIRING COST TOTALS ($)	EST REPAIR COST ($)	EST NEW EQUIP COST ($)	BLDG COST TOTALS ($)
9	6997.00	17515.00	0.00	24512.00
11	6997.00	17515.00	0.00	24512.00
20	11579.00	17515.00	0.00	29094.00
27	6201.00	17515.00	0.00	23716.00
28	6997.00	17515.00	0.00	24512.00
35	6997.00	17515.00	0.00	24512.00
37	6997.00	17515.00	110.00	24622.00
55	10058.00	17515.00	0.00	27573.00
59	16033.00	17515.00	0.00	33548.00
82	4691.00	17515.00	0.00	22206.00
105	6855.00	17515.00	0.00	24370.00
115	6997.00	17515.00	0.00	24512.00
117	6997.00	17515.00	0.00	24512.00
133	11579.00	17515.00	0.00	29094.00
134	6242.00	17515.00	0.00	23757.00
139	6997.00	17515.00	0.00	24512.00
161	11579.00	17515.00	0.00	29094.00
163	8507.00	17515.00	0.00	26022.00
165	4650.00	17515.00	0.00	22165.00
185	37160.00	17515.00	0.00	54675.00
201	6997.00	17515.00	0.00	24512.00
TOTAL	198107.	367815.00	110.00	566032.

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-9 - BUILDING COST TOTAL

BLDG NO	EQUIP & WIRING COST TOTALS ($)	EST REPAIR COST ($)	EST NEW EQUIP COST ($)	BLDG COST TOTALS ($)
9	7805.00	17515.00	0.00	25320.00
11	7805.00	17515.00	0.00	25320.00
20	12195.00	17515.00	0.00	29710.00
27	6915.00	17515.00	0.00	24430.00
28	7805.00	17515.00	0.00	25320.00
36	7805.00	17515.00	0.00	25320.00
37	7805.00	17515.00	110.00	25430.00
56	10675.00	17515.00	0.00	28190.00
59	16835.00	17515.00	0.00	34350.00
82	5595.00	17515.00	0.00	23110.00
105	7285.00	17515.00	0.00	24800.00
116	7805.00	17515.00	0.00	25320.00
117	7805.00	17515.00	0.00	25320.00
133	12195.00	17515.00	0.00	29710.00
134	7145.00	17515.00	0.00	24660.00
138	7805.00	17515.00	0.00	25320.00
161	12195.00	17515.00	0.00	29710.00
163	9125.00	17515.00	0.00	26640.00
165	5365.00	17515.00	0.00	22880.00
185	40045.00	17515.00	0.00	57560.00
201	7805.00	17515.00	0.00	25320.00
TOTAL	215815.	367815.00	110.00	583740.

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-C - BUILDING COST TOTAL

BLDG NO	EQUIP & WIRING COST TOTALS ($)	EST REPAIR COST ($)	EST NEW EQUIP COST ($)	BLDG COST TOTALS ($)
3	6750.00	17515.00	0.00	24265.00
11	6750.00	17515.00	0.00	24265.00
20	9670.00	17515.00	0.00	27185.00
27	6305.00	17515.00	0.00	23820.00
28	6750.00	17515.00	0.00	24265.00
36	6750.00	17515.00	0.00	24265.00
37	6750.00	17515.00	110.00	24375.00
56	8740.00	17515.00	0.00	26255.00
53	12240.00	17515.00	0.00	29755.00
82	5275.00	17515.00	0.00	22790.00
105	6830.00	17515.00	0.00	24345.00
115	6750.00	17515.00	0.00	24265.00
117	6750.00	17515.00	0.00	24265.00
133	9670.00	17515.00	0.00	27185.00
134	6235.00	17515.00	0.00	23750.00
139	6750.00	17515.00	0.00	24265.00
161	9670.00	17515.00	0.00	27185.00
163	7780.00	17515.00	0.00	25295.00
165	5345.00	17515.00	0.00	22860.00
185	21865.00	17515.00	0.00	39380.00
201	6750.00	17515.00	0.00	24265.00
TOTAL	171375.	367815.00	110.00	539300.

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-D - BUILDING COST TOTAL

BLDG NO	EQUIP & WIRING COST TOTALS ($)	EST REPAIR COST ($)	EST NEW EQUIP COST ($)	BLDG COST TOTALS ($)
9	5615.00	17515.00	0.00	23130.00
11	5615.00	17515.00	0.00	23130.00
20	7325.00	17515.00	0.00	24840.00
27	5285.00	17515.00	0.00	22800.00
28	5615.00	17515.00	0.00	23130.00
35	5615.00	17515.00	0.00	23130.00
37	5615.00	17515.00	110.00	23240.00
56	6755.00	17515.00	0.00	24270.00
59	8945.00	17515.00	0.00	26460.00
82	4745.00	17515.00	0.00	22260.00
105	5435.00	17515.00	0.00	22950.00
116	5615.00	17515.00	0.00	23130.00
117	5615.00	17515.00	0.00	23130.00
133	7325.00	17515.00	0.00	24840.00
134	5345.00	17515.00	0.00	22860.00
138	5615.00	17515.00	0.00	23130.00
161	7325.00	17515.00	0.00	24840.00
163	6155.00	17515.00	0.00	23670.00
165	4685.00	17515.00	0.00	22200.00
185	18310.00	17515.00	0.00	35825.00
201	5615.00	17515.00	0.00	23130.00
TOTAL	138170.	367815.00	110.00	506095.

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-E - BUILDING COST TOTAL

BLDG NO	EQUIP & WIRING COST TOTALS ($)	EST REPAIR COST ($)	EST NEW EQUIP COST ($)	BLDG COST TOTALS ($)
9	4778.00	17515.00	0.00	22293.00
11	4778.00	17515.00	0.00	22293.00
20	5609.00	17515.00	0.00	23124.00
27	4718.00	17515.00	0.00	22233.00
28	4778.00	17515.00	0.00	22293.00
36	4778.00	17515.00	0.00	22293.00
37	4778.00	17515.00	110.00	22403.00
55	5484.00	17515.00	0.00	22999.00
59	7517.00	17515.00	0.00	25032.00
82	4528.00	17515.00	0.00	22043.00
105	4032.00	17515.00	0.00	21547.00
116	4778.00	17515.00	0.00	22293.00
117	4778.00	17515.00	0.00	22293.00
133	5609.00	17515.00	0.00	23124.00
134	4683.00	17515.00	0.00	22198.00
138	4778.00	17515.00	0.00	22293.00
161	5609.00	17515.00	0.00	23124.00
163	5329.00	17515.00	0.00	22844.00
165	3446.00	17515.00	0.00	20961.00
185	12576.00	17515.00	0.00	30091.00
201	4778.00	17515.00	0.00	22293.00
TOTAL	112142.	367815.00	110.00	480067.

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-A - DISCOUNTED AND SIMPLE PAYBACK PERIOD AT EXP YEAR OPERATION

NO OF BLDGS		OPERATING & MAINTENANCE COST ($)	TOTAL ECS COST ($)	TOTAL COST ($)	DISCOUNTED PAYBACK PERIOD (YRS)	SIMPLE PAYBACK PERIOD (YRS)	BTU SAVED PER DOLLAR INVESTED	TOTAL ENERGY SAVINGS ($)
1	133	38323.32	206013.30	244336.62	*	14.53	10145.	14181.76
2	161	40055.89	242663.36	282719.25	*	9.13	16226.	26532.37
3	134	41470.64	272590.34	314060.98	*	7.57	19530.	35938.90
4	28	42030.35	303468.40	345398.75	*	6.76	21853.	44872.70
5	185	46186.29	372343.15	418529.44	*	6.60	21562.	56398.28
6	59	48184.10	414663.97	462768.07	*	6.59	21688.	62934.93
7	36	49643.81	445482.03	495125.84	*	6.50	21687.	68549.71
8	105	51895.06	476181.21	527276.28	*	6.46	21892.	73725.28
9	56	52737.06	510915.25	563652.31	*	6.55	22045.	77977.44
10	9	54196.77	541793.31	595990.08	*	6.60	21896.	82043.94
11	27	55609.07	571668.64	627277.72	*	6.64	22149.	86101.30
12	117	57068.78	602546.70	659615.49	*	6.71	21922.	89813.79
13	37	58535.04	633563.33	692098.37	*	6.79	21659.	93293.95
14	138	59994.75	664441.39	724436.14	*	6.87	21414.	96727.04
15	201	61877.27	704263.41	766140.68	*	7.04	20724.	100033.27
16	20	63609.84	740913.47	804523.31	*	7.18	20146.	103165.56
17	11	65069.55	771791.53	836861.08	*	7.29	19858.	105876.61
18	163	66619.18	804571.76	871190.94	*	7.42	19672.	108418.71
19	82	67941.57	832544.92	900486.49	*	7.56	19429.	110183.30
20	116	69401.28	863422.98	932824.26	*	7.71	19034.	111933.30
21	165	70721.22	891344.50	962065.72	*	7.87	18739.	113302.21

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-B - DISCOUNTED AND SIMPLE PAYBACK PERIOD AT EXP YEAR OPERATION

NO OF BLDGS		OPERATING & MAINTENANCE COST ($)	TOTAL FCS COST ($)	TOTAL COST ($)	DISCOUNTED PAYBACK PERIOD (YRS)	SIMPLE PAYBACK PERIOD (YRS)	BTU SAVED PER DOLLAR INVESTED	TOTAL ENERGY SAVINGS ($)
1	131	36934.00	176624.22	213558.22	*	12.45	11033.	14181.76
2	161	38703.26	214050.26	252753.52	*	8.05	18395.	26592.37
3	134	40171.78	245114.76	285286.54	*	6.81	21720.	35999.90
4	28	41679.60	277010.67	318690.27	*	6.17	23940.	44872.70
5	185	45107.35	349519.69	394627.04	*	6.20	22970.	56399.28
6	59	47152.92	392790.80	439943.72	*	6.24	22892.	62934.93
7	36	48660.75	424686.71	473347.45	*	6.20	22749.	68549.71
8	105	50137.61	455927.56	506065.17	*	6.18	22864.	73726.28
9	56	51816.34	491438.85	543255.19	*	6.30	22918.	77977.44
10	9	53324.17	523334.75	576658.92	*	6.38	22668.	82049.94
11	27	54778.99	554109.52	608888.51	*	6.44	22851.	86101.30
12	117	56286.82	586005.43	642292.25	*	6.52	22541.	89813.79
13	37	57801.20	618039.90	675841.10	*	6.62	22203.	93293.95
14	138	59309.02	649935.81	709244.83	*	6.72	21892.	96727.04
15	201	60816.85	681831.72	742648.57	*	6.82	21406.	100033.27
16	20	62586.10	719257.76	781843.86	*	6.97	20752.	103165.56
17	11	64093.93	751153.67	815247.60	*	7.09	20403.	105876.61
18	163	65680.36	784712.40	850392.76	*	7.24	20170.	108419.71
19	82	67256.58	813824.34	881080.92	*	7.39	13876.	110183.30
20	116	68564.41	845720.25	914284.66	*	7.56	19432.	111939.30
21	165	69926.93	874542.46	944469.39	*	7.72	19099.	113302.21

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-C - DISCOUNTED AND SIMPLE PAYBACK PERIOD AT EXP YEAR OPERATION

NO OF BLDGS	OPERATING & MAINTENANCE COST ($)	TOTAL ECS COST ($)	TOTAL COST ($)	DISCOUNTED PAYBACK PERIOD (YRS)	SIMPLE PAYBACK PERIOD (YRS)	BTU SAVED PER DOLLAR INVESTED	TOTAL ENERGY SAVINGS ($)
1 133	35390.15	143966.19	179356.33	*	10.15	14518.	14181.76
2 161	37609.04	178211.46	215220.49	*	6.70	22035.	26592.37
3 134	38423.37	208129.62	246552.98	*	5.78	25579.	35938.90
4 28	39868.37	238696.53	278564.90	*	5.32	27783.	44872.70
5 185	42213.48	288303.99	330517.46	*	5.11	27847.	56338.28
6 59	43985.41	325786.72	369772.13	*	5.18	27600.	62934.93
7 36	45430.41	356353.63	401784.04	*	5.20	27112.	68548.71
8 105	46880.18	387021.32	433901.49	*	5.25	26935.	73726.28
9 56	48443.68	420095.06	468538.74	*	5.39	26810.	77977.44
10 9	49888.68	450661.97	500550.65	*	5.49	26324.	82043.94
11 27	51307.18	480668.31	531975.49	*	5.58	26343.	86101.30
12 117	52752.18	511235.22	563987.40	*	5.69	25838.	89813.79
13 37	54203.73	541940.70	595144.43	*	5.91	25320.	93233.95
14 138	55648.73	572507.61	628156.35	*	5.92	24852.	96727.04
15 201	57093.73	603074.52	660168.26	*	6.03	24202.	100033.27
16 20	58712.62	637719.79	696032.42	*	6.18	23421.	103165.56
17 11	60157.62	667886.71	728044.33	*	6.31	22947.	105876.61
18 163	61663.96	699751.12	761415.08	*	6.45	22619.	108419.71
19 82	63121.12	728459.96	791481.08	*	6.61	22205.	110183.30
20 116	64466.12	759026.87	823492.99	*	6.78	21652.	111933.30
21 165	65827.45	787823.88	853651.34	*	6.95	21201.	113302.21

FY 77 INSTALLATION: FT.SOMEWHERE, USA

COMPANY-D - DISCOUNTED AND SIMPLE PAYBACK PERIOD AT EXP YEAR OPERATION

NO OF BLDGS		OPERATING & MAINTENANCE COST ($)	TOTAL ECS COST ($)	TOTAL COST ($)	DISCOUNTED PAYBACK PERIOD (YRS)	SIMPLE PAYBACK PERIOD (YRS)	BTU SAVED PER DOLLAR INVESTED	TOTAL ENERGY SAVINGS ($)
1	133	34166.68	118085.40	152252.08	*	8.33	17700.	14181.76
2	161	35645.92	149376.65	185022.57	*	5.62	26360.	26592.37
3	134	37007.25	178173.67	215180.91	*	4.95	23880.	35998.90
4	28	38304.66	207310.80	245695.46	*	4.62	31959.	44872.70
5	185	40518.07	252439.99	292958.05	9.92	4.48	31803.	56398.28
6	59	42093.78	285771.97	327865.75	9.52	4.54	31465.	62934.93
7	36	43471.19	314909.10	358380.30	9.27	4.59	30680.	68548.71
8	105	44937.88	343819.49	388657.38	9.13	4.66	30319.	73726.28
9	56	46283.18	374392.70	420675.88	9.16	4.80	30093.	77977.44
10	9	47660.59	403529.84	451190.43	9.20	4.92	29398.	82049.94
11	27	49018.35	432251.28	481269.62	9.21	5.02	29294.	86101.30
12	117	50195.76	461388.42	511784.17	9.29	5.14	28629.	89813.79
13	37	51779.72	490664.12	542443.84	9.39	5.26	27967.	93293.95
14	138	53157.13	519801.26	572958.39	9.49	5.37	27372.	96727.04
15	201	54534.54	548938.40	603472.94	9.60	5.49	26588.	100033.27
16	20	56113.78	580229.65	635243.43	9.77	5.62	25725.	103165.56
17	11	57391.19	609366.78	666757.97	9.93	5.76	25151.	105876.61
18	163	58800.76	639184.17	697984.93	*	5.90	24762.	108418.71
19	82	60126.36	667225.36	727351.71	*	6.06	24243.	110183.38
20	116	61503.77	696362.50	757866.26	*	6.22	23600.	111939.30
21	165	62825.80	724328.10	787153.93	*	6.39	23060.	113302.21

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COMPANY-E - DISCOUNTED AND SIMPLE PAYBACK PERIOD AT EXP YEAR OPERATION

NO OF BLDGS		OPERATING & MAINTENANCE COST ($)	TOTAL ECS COST ($)	TOTAL COST ($)	DISCOUNTED PAYBACK PERIOD (YRS)	SIMPLE PAYBACK PERIOD (YRS)	BTU SAVED PER DOLLAR INVESTED	TOTAL ENERGY SAVINGS ($)
1	133	41084.34	264418.59	305502.92	*	18.64	7904.	14181.76
2	161	42461.39	293548.17	336009.56	*	11.04	13414.	26532.37
3	134	43783.30	321511.25	365294.55	*	8.93	16559.	35998.90
4	28	45110.66	349594.01	394704.68	*	7.79	18969.	44872.70
5	185	46902.81	387500.61	434402.81	*	6.87	20719.	56339.28
6	59	48393.48	419033.12	467426.60	*	6.66	21458.	62934.93
7	36	49721.65	447115.80	496836.93	*	6.52	21608.	68548.71
8	105	51004.19	474258.89	525263.08	*	6.43	21980.	73726.28
9	56	52373.80	503231.01	555604.81	*	6.45	22381.	77977.44
10	9	53701.36	531313.77	585015.13	*	6.48	22328.	82049.94
11	27	55025.36	559320.95	614346.30	*	6.50	22638.	86101.30
12	117	56352.92	587403.71	643756.63	*	6.54	22498.	89813.79
13	37	57687.04	615625.03	673312.07	*	6.60	22230.	93293.95
14	138	59014.60	643707.79	702722.40	*	6.65	22103.	96727.04
15	201	60342.17	671790.55	732132.72	*	6.72	21726.	100033.27
16	20	61719.22	700920.13	762639.36	*	6.79	21295.	103165.56
17	11	63046.79	729002.89	792049.68	*	6.89	21023.	105875.61
18	163	64407.17	757779.75	822186.92	*	6.99	20886.	108419.71
19	82	65719.89	785547.59	851267.43	*	7.13	20591.	110183.30
20	116	67047.41	813630.34	880677.76	*	7.27	20199.	111939.30
21	165	68395.66	840935.17	909330.82	*	7.41	19894.	113302.21

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